

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1930

Mar. 15	Ass. Football. R.A.F. v. Army, at Homerton.
Mar. 19	Fencing. R.A.F. v. Army at Aldershot.
Mar. 22	Inter-Services Rugby, R.A.F. v. Army at Twickenham.
Mar. 26	R.Ae.C. House Dinner, and Ann. Gen. Meeting.
Mar. 26	R.A.F. Cross-Country Championship.
Mar. 27	British Gliding Ass. Inaugural Meeting.
Mar. 29	Ass. Football. R.A.F. v. R.N. at Millwall.
April 3	"Operation of the Aero-Postale Service in Europe." Lecture by M. P. Grimaud before R.Ae.S.
April 5	N.F.S. Air Meeting, Reading.
April 12	N.F.S. Air Meeting, Hull.
April 19	Leicester Flying Meeting.
April 21	N.F.S. Air Meeting, Hanworth.
April 26	N.F.S. Air Meeting, Leeds.
June 7	N.F.S. Air Meeting, Reading.
June 15	N.F.S. Air Meeting, Nottingham.
June 19	Household Brigade Flying Club Meeting at Heston.
June 21	Air Rallye at Haldon Aerodrome, Teignmouth.
June 26	Ipswich Air Pageant.
June 27	R.A.F. Dinner Club Annual Dinner.
June 28	Royal Air Force Display, Hendon.
July 5	King's Cup Race.
July 13	N.F.S. Flying Meeting, Leeds.
July 19	N.F.S. Flying Meeting, Hull.
July 20- Aug. 7	International Light 'Plane Tour of Europe, starting from Berlin.
July 26	Norwich Flying Meeting.
July 31	Entries close for 1931 Schneider Trophy Contest.
Sept. 1-6	5th International Air Congress at The Hague.
Sept. 6-28	Aero Exhibition, Stockholm, Sweden.
Sept. 20	Liverpool Air Pageant.
Sept. 27	N.F.S. Air Meeting, Hanworth.
Nov. 28-	
Dec. 14	Paris Aero Show.
Dec. 31	Closing date for the Aga Khan's Prize for Indian Flight.

EDITORIAL COMMENT



WHEN disarmament is in the air, and when Great Britain is showing the world how to save money on insurance premia, it is surprising, and, we may add, gratifying to find the Air Estimates showing an increase over the figures of last year. The net increase amounts to £890,000, and the total estimated expenditure is £20,923,800. Figures require a great deal of examination and explanation before they convey a clear impression to the mind of the taxpayer. In the first place, the Air Ministry does not only deal with a fighting service. It also administers and subsidises civil flying, which accounts for over half a million. The Estimates also provide for what are called non-effective services, which means the half-pay list, pensions, and such like. They cost well over a quarter of a million, and they add nothing to actual flying; though there is no item for which the taxpayer more readily foots the bill. Welfare work is now even more popular than disarmament; and perhaps the most economically-minded citizen may regret to learn that of the three Votes on which it has been found possible to show a decreased expenditure, two are Medical Services and Educational Services. Yet when one examines the details there is no proof that sick airmen will be less efficiently tended or that the hale and hearty in body will be allowed to develop dry rot in the brain. The decreases amount only to £8,000 and £5,000 respectively. The saving on educational services is entirely due to almost halving the expenditure on the School of Technical Training at Manston. The third Vote which shows a decrease is Works, Buildings and Lands, and it shows the very substantial decrease of £144,000. This is an item of Air Ministry expenditure against which a good deal of criticism has from time to time been directed. Everyone has heard such remarks as "Why do they waste money on the ground? It should be spent on the air." If all the critics would make a tour of R.A.F. stations and see how the majority of officers

and airmen are housed, they would probably change their tune and clamour for more expenditure on buildings.

The remaining eight Votes all show an increase. The Vote which shows the smallest increase is that which pays for the Air Ministry. This item is up by £14,000, and yet we note that the staff at the Air Ministry has been decreased by six officers. The salaries of shorthand typists and clerks have increased in amount, yet the details show no evidence of startling or undue extravagance. Moderate increases have taken place in many directions, and one can only conclude that as the work of the Ministry grows, as it is bound to grow, so the expense is bound to expand. Meteorological and miscellaneous effective services show an increase of £17,000; and we must expect still further increases under this Vote in the future. We cannot have too much information about meteorology, which benefits many subjects besides aeronautics; and at present our expenditure on the subject is the very moderate sum of £269,000. The Vote for Auxiliary and Reserve Forces amounts to £591,300, which is an increase of £35,000 on last year. The country gets excellent value for this outlay, and further future increases under this Vote must be not only expected but desired. Vote 2, which deals with Quartering, Non-technical Stores, Supplies and Transport, shows an increase of £59,000. The Pay, etc., of the Royal Air Force is to cost £142,000 more than it did last year, and now amounts to £4,449,000. No reasonable person is likely to quarrel with those figures. Our Air Force is small enough as it is, and it is certainly not over-paid.

The two Votes in which readers of FLIGHT usually take most interest are Vote 3 (Technical and War-like Stores, including Experimental and Research Services) and Vote 8 (Civil Aviation). The former provides for £9,496,000, which is an increase of £642,000; and the latter provides for £547,000, which is an increase of £89,000. Contrary to what is generally supposed, the cost of the airship development programme is included in Technical Stores and not in Civil Aviation. Airships are divided into two sub-heads, namely: Purchase (£12,000), which means provision for design work to incorporate the results of experience, and Development (£342,000). The latter includes a sum of £33,000 for developing a new mechanical means of moving an airship into a shed without a landing party of the enormous size hitherto found necessary. If the device proves successful, it should ultimately be an economy. In any case, it would be worse than folly to object to expenditure on research and experiment which offered any reasonable chance of increasing the utility of aircraft.

The greater part of Vote 3 is to be expended as follows:—

	1930. £	*1929. £
Complete machines (landplanes and seaplanes)	3,624,000	3,135,000
Complete engines	1,946,000	1,874,000
Machine spares, parachutes, and miscellaneous	670,000	700,000
Engine spares	400,000	370,000
	<u>£6,640,000</u>	<u>£6,079,000</u>

* Including supplementary estimate.

It is a provision which should bring a certain amount of comfort to the hearts of the aircraft

industry. At least, the firms may congratulate themselves that they are not, for the most part, contractors to the Admiralty or the War Office. The purchase of complete machines and engines does not imply much expansion in the strength of the Royal Air Force. Air Defence of Great Britain will only be expanded by one cadre squadron of the Special Reserve. The Coastal Area is to gain one squadron of flying-boats and two new flights for the Fleet Air Arm. The money is to go mainly on re-equipment. This is a chronic need of the Royal Air Force. Re-equipment always lags sadly in the rear of design, and the fighter squadrons seem to be the chief sufferers. Last summer at the Hendon Display, No. 3 F.S. was able to put a few Bulldogs into the air, though they were not permitted to show off their paces. Now No. 17 F.S. also has Bulldogs, and No. 54 F.S., which is in process of formation, is to have the same type. But the bulk of the fighter squadrons have Siskins, while one, No. 23 F.S., still has Gamecocks—and is said to be deeply attached to them. We must expect that by the next Display the Bulldog itself will as a type be out of date, though it is extremely improbable that it will then be even the predominant type in the Fighting Area. Meantime, we must prepare for the advent of the interception fighter. The squadrons in the overseas commands are obliged to be even more tenacious of obsolete types. Some have blossomed out into Wapitis and Fairey IIIF's, but the D.H.9A and the Bristol Fighter still chiefly prevail.

It is certainly time that serious attention was paid to this undesirable state of affairs. Quite possibly Lord Thomson has welcomed a year in which, to quote his own memorandum, "the approved increases of the Royal Air Force are of small dimensions, and are designed to demonstrate once more the earnest desire of His Majesty's Government to avoid disastrous competition in air armaments." Had many new squadrons to be raised, it might have been hard to screw the necessary funds for those units and also for re-equipment out of the Treasury. As the policy of expansion is to mark time for a year, it became easier to grapple with the problem of obsolete types. The squadrons in India and others in like case will be able to exclaim that it is an ill spirit of disarmament which blows nobody any good.

Civil aviation continues to progress on lines which, when we compare British policy with that of certain foreign countries, may be described as economical. We rather incline to the opinion that the granting of mail contracts is a sounder way of helping airways than the grant of direct subsidies; but as subsidies go, ours are moderate. A sum of £448,000 is set aside for subsidies to Imperial Airways, light aeroplane clubs, and National Flying Services. The allocation is: Transport services, £428,000; clubs, £15,000; N.F.S., £5,000. The main item of the increase is £60,000 to Imperial Airways to help in starting the air service to South Africa, Dominion and Colonial Governments are contributing £20,000 this year towards the cost of this airway. Another increase under the Civil Aviation Vote which we note with pleasure is an additional £7,000 for works, buildings and lands, most of which, it is stated, will go to the improvement of Croydon aerodrome. We all want to see that aerodrome the best civil aerodrome in the world.

D.H. "MOTH SIX"

Landplane or Seaplane

THE British type of two-seater light 'plane has had, is having, and will undoubtedly continue to have, a very large market all over the world. But just as the motor-car world is not entirely made up of the cheap two-seater or four-seater, but has in addition a less numerous but equally important class of larger, more powerful, more luxurious, and more expensive types, so it is quite certain that in the aviation world we shall have a class of machine more powerful and with greater seating capacity than the familiar two-seater light 'plane. The home market for this type will not, for some years to come at any rate, be a large one. But that a few well-to-do people will, once they have sampled the joys of flying in a really luxurious aircraft wish to own one is not to be doubted. And then there is its usefulness as an "air taxi." When the N.F.S. scheme of aerodromes all over the country is in working order, and when all municipalities of any importance have their own aerodromes, the use of "air taxis" will become quite



obtained equipped as an occasional six-seater. The "Moth Six" is a development of the "Hawk Moth," of which the first experimental example was produced early last year, but which has been in abeyance until now, due to pressure of other work. The machine is, as our illustrations show, a strut-braced monoplane of the type which recently the Germans have taken to calling a "shoulder-decker," from the fact that the wing does not run across, and rest on,

the fuselage, but is attached to the top longerons. This arrangement has the advantage that a transparent roof or skylight can be provided over the entire cabin, which, in conjunction with the side windows, gives a very light interior, and a good view in almost all directions.

The "Moth Six" follows fairly closely the arrangement of the "Hawk Moth" prototype, the main changes, apart from the altered seating accommodation, being an increase of 16 in. in the wing chord, and a wing section of slightly greater camber, giving the machine a shorter take-off and a better angle of climb.

The construction is of the "mixed" type, with a steel tube fuselage and wooden wings. The four longerons are of square section steel tube, braced in the front portion by steel struts of the same section, attached by bolting, and in the rear part with round section tubes welded to the longerons and with wire bracing in top and bottom panels.

The wings have wooden box spars and spruce ribs, but the ailerons are of welded steel tube construction. A plywood covering is used over the leading edge and extends up to the front spar. The wing bracing on each side is by two steel tube struts of streamline section, and a jury strut is carried permanently, its free end resting normally in a socket and the jury strut serving, when the wings are to be folded, to support the front corner, petrol tank, etc. The tail surfaces are of welded steel tube, fabric covered, and a tail plane trimming gear is provided.

The undercarriage of the land machine is of wide track,



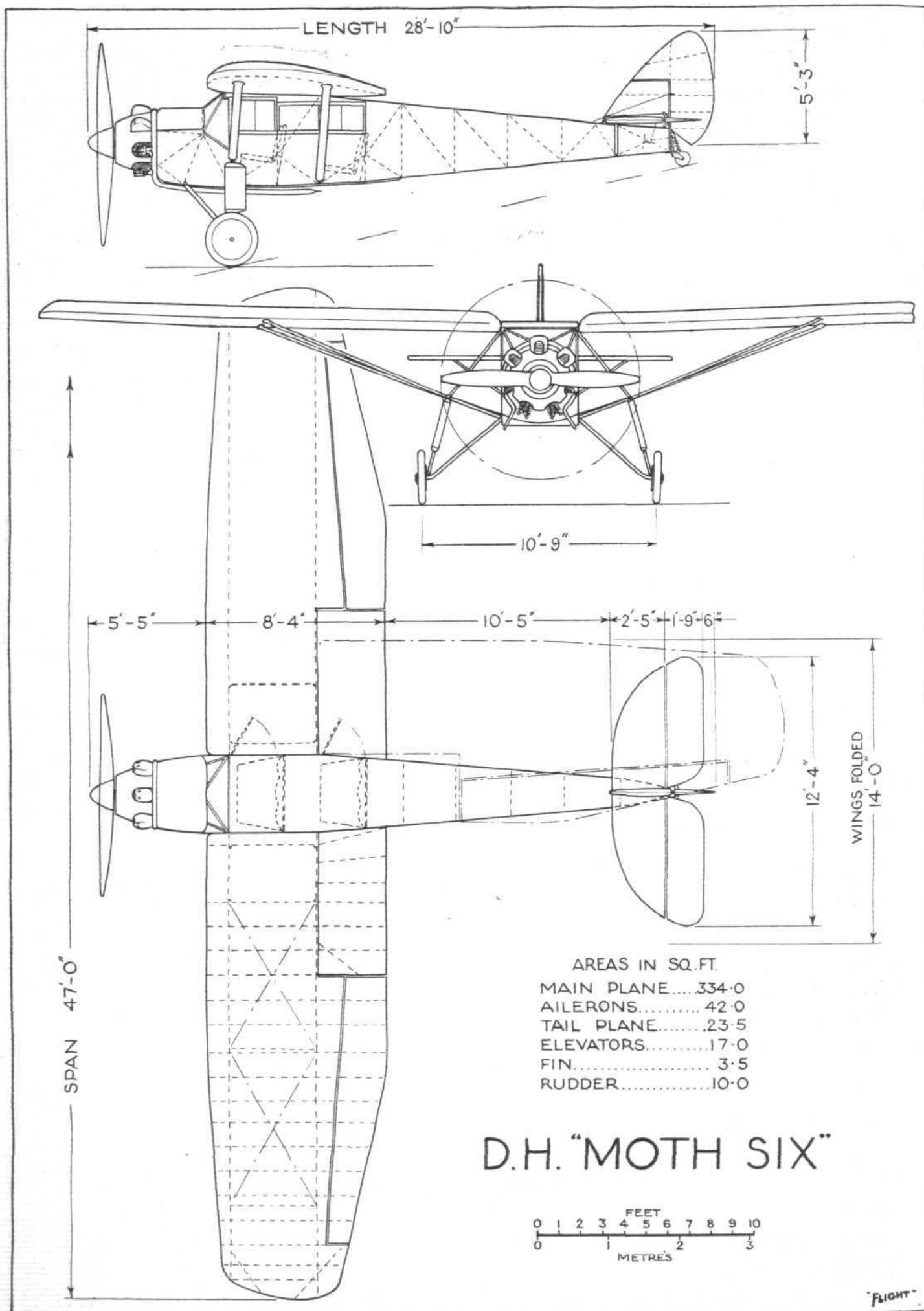
THE DE HAVILLAND "MOTH SIX": The photographs on this page, for which we are indebted to Short Brothers, show the machine as a seaplane, with floats designed and manufactured by Short Brothers of Rochester.

Note the helmets on the top cylinders of the "Lynx" engine.

general, and large numbers of suitable machines will then be required. And in the Dominions there is already a market for the class of machine larger and more powerful than the two-seater, but less costly than the three-engined "air liner"; in other words, for the type of machine which has become known as the "feeder line" type.

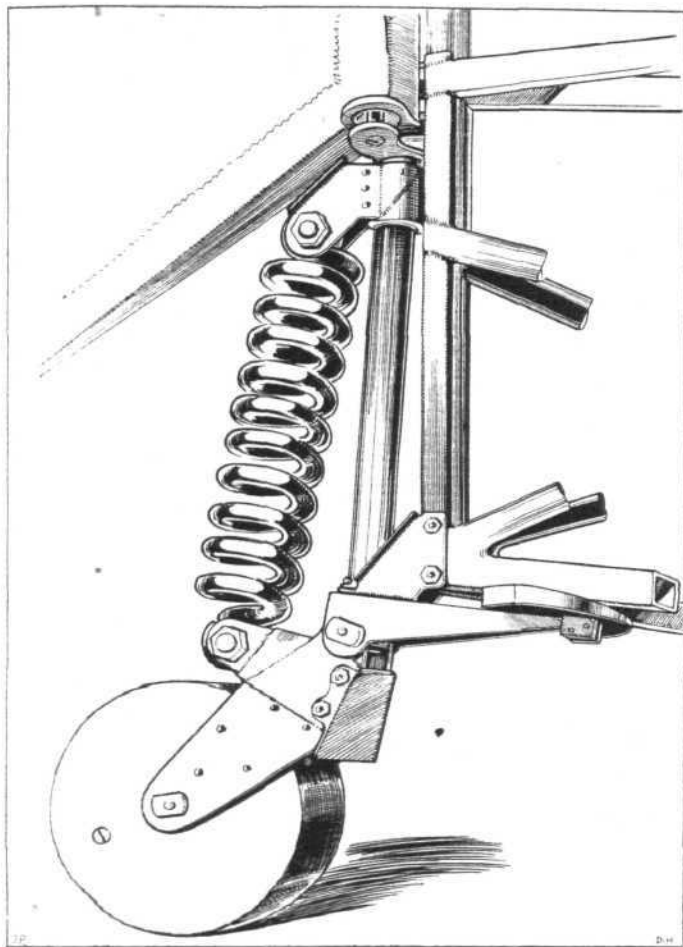
Realising these possibilities, the De Havilland Aircraft Company has put in hand a batch of machines of a type which will be known as the "Moth Six" from the fact that, although normally supplied as a four-seater, it can also be





THE DE HAVILLAND "MOTH SIX" : General Arrangement Drawings of the machine as a landplane. The engine can be either an Armstrong-Siddeley geared "Lynx," or a Wright type R.975 of 300 h.p.

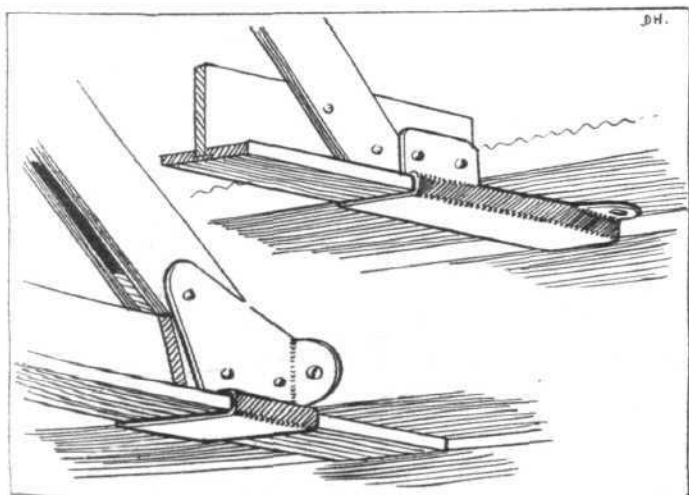
and is of the "split" type, with bent axle and a forward radius strut hinged to the lower longeron, while the telescopic leg hinges to a tripod springing from the corners of the fuselage. Rubber blocks of streamline shape form the shock-absorbing medium. Wheel brakes are fitted, operated by



The tail wheel on the "Moth Six" is steerable, but a certain degree of play is allowed so as to avoid transmitting shocks to the rudder. (FLIGHT Sketch.)

a lever in the cockpit, and a steerable tail wheel takes the place of the hitherto more usual tail skid.

The normal power plant of the "Moth Six" is the Armstrong-Siddeley geared "Lynx" of 240 h.p., but if desired the machine can be supplied with a Wright "Whirlwind" type R.975, of 300 h.p. The petrol tanks are housed in the wing, one on each side, and two sizes have been standardised: a larger of 35 gallons and a smaller of 17½ gallons. When the machine is equipped as a four-seater, the larger size will normally be fitted, while if it is to be used mostly as



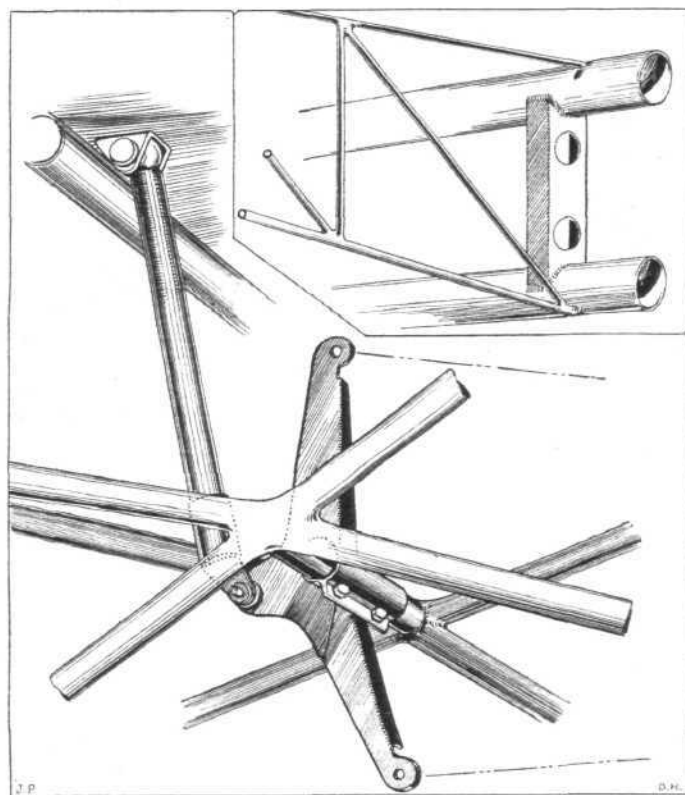
The wooden ribs are attached to the wooden spars by small metal brackets. (FLIGHT Sketch.)

a six-seater, a certain amount of range will have to be sacrificed, and the smaller tanks will be installed.

The cabin, provided with entrance doors on both sides has, in front, the pilot's seat on the port side, and beside him a seat for a passenger. According to whether the machine is used as a four-seater or a six-seater, the luggage compartment is placed behind or in front of the aft seat. In the former case there is quite exceptional leg room, while in the latter the aft seat is moved slightly farther aft leaving room in the middle for either a luggage compartment or a seat for two extra passengers. The cabin covering is in the form of two layers of leather with a layer of felt between them, to deaden the engine noise.

The "Moth Six" can be supplied either as a landplane or as a seaplane. It is shown in the general arrangement drawings as a landplane, while the photographs show the seaplane version.

With the "Lynx" engine the "Moth Six" has a tare weight of 2,380 lb. and a gross weight of 3,650 lb. As a four-seater the load is made up of 70 gallons of fuel, 9 gallons of



The tail plane trimming gear on the "Moth Six." Inset, aileron construction in welded steel. (FLIGHT Sketches)

oil, and a weight of pilot and pay load of 644 lb. The range is then 560 miles. As an occasional six-seater, the fuel is decreased to 35 gallons, the range to 280 miles, and pilot and pay load 913 lb.

In the seaplane version the tare weight is increased to 2,653 lb., with pilot and pay load 521 lb., range 540 miles (with 70 gallons) and gross weight 3,800 lb. Or range 270 miles (35 gallons) and pilot and pay load 790 lb.

Performance

	Landplane	Seaplane
	3,650 lb.	3,800 lb.
Max. speed at ground level ..	127 m.p.h.	123.5 m.p.h.
Cruising speed at 1,000 ft. ..	105 "	100 "
Max. speed at 5,000 ft. ..	120 "	116.5 "
Max. speed at 10,000 ft. ..	113 "	107 "
Stalling speed ..	54 "	54 "
Rate of climb at ground level	710 ft./min.	620 ft./min.
Time to climb to 5,000 ft. ..	8.5 min.	10 min.
Time to climb to 10,000 ft. ..	21.5 "	28 "
Absolute ceiling ..	17,000 ft.	14,500 ft.
Service ceiling ..	14,500 "	12,000 "
Time to unstick ..	17 sec.	25 sec.
Distance to unstick ..	230 yards.	
Landing run with brakes ..	240 "	
Landing run without brakes ..	320 "	

(Concluded on page 309.)

BARON MANFRED VON RICHTHOFEN*

EVERYONE has heard of the great von Richthofen, and everyone interested in war flying must want to know as much as possible about him. This book tells a great deal, and so, although the writing is a poor attempt at flamboyant journalese, and the drawings are far from the best that Mr. Clayton Knight can do, it is still a book of absorbing interest.

The author has taken infinite pains to collect details of every one of the 80 victories which were officially credited to Manfred von Richthofen. He has examined his official reports, he has had access to his private collection of trophies, he publishes a number of his letters to his mother, and he has compared the German accounts of the fights with the records of the R.F.C. and R.A.F. Wherever possible he has traced out a survivor of a fight and obtained his account of the incident. All this is very good work indeed, and excuses the faults of the writer's style.

In this biography, Manfred von Richthofen appears as a typical Prussian Junker, but one of the best of that somewhat unpleasing type. He was a professional soldier, and when the war broke out he was a 2nd Lieutenant in a regiment of Uhlans. It is suggested that he was a daring, but not a very good, horseman. He was certainly not a good cavalry officer. He was a poor student. He had no little difficulty in learning to fly. His early instructors must have been surprised at his ultimate success.

This book represents its hero as a ruthless killer, who preferred single combat because he could see the man he was killing. It is said that he loved his trophies as evidences of his personal prowess. Though he was an absolutely fair and honourable fighter, and though he showed every courtesy to prisoners whom he forced down behind the German lines, he is represented in the main as a somewhat inhuman scalp-hunter.

One wonders if this picture is quite fair to Richthofen. Though he was certainly of a type inferior to that of Boelcke, the Saxon, it seems scarcely credible that he should have been the inspiration which he certainly was to the German flying corps if his chief characteristic was a desire to add to his own tale of victories. One feels that von Richthofen must have had greater qualities than that.

Apart from his personal character, one would like to learn what were the guiding principles on which Richthofen acted in his fighting, and in commanding. It was Boelcke who first conceived the idea of organising the German air fighters so as to break the supremacy which the R.F.C. had established during the Somme battles. When Boelcke was killed in a collision with another Albatros, Richthofen succeeded him and developed his work. He seems to have worked out a technique of fighting and taught it to his officers. Then he developed formation flying, and ultimately became what we should call a Wing Commander, controlling the action of several Staffels, or squadrons. His Wing was known to the British as "the Circus." In the main he used his fighters defensively, waiting for the British to cross the lines and then attacking them. The Circus hardly ever acted as escort to German reconnaissance aircraft. Consequently, though the Circus wrought great havoc among the British photographic and artillery machines, it did not prevent the British from attaining the objects for which the R.F.C. was employed. In his reports Richthofen constantly speaks of a west wind as favourable and an east wind as unfavourable to his fighting tactics. In short, he preferred to fight behind the German lines. One would gather from this book that one of his reasons for this preference was that confirmation of a victory was certain when the machine fell on German territory. If that is to be accepted, though it seems hardly credible, Richthofen must have had more regard for the success of his own arm than for that of the German cause. The British rightly took the opposite view, and used the R.F.C. as a means of furthering the interests of the infantry and artillery. Our fighter aeroplanes existed merely to protect the reconnaissance and artillery aeroplanes.

An analysis of Richthofen's victories does not help us much to read what was in the man's mind. He was officially credited with 80 victories, all over British machines. Of these, 30 were single-seater fighters, 27 were reconnaissance and artillery machines (mainly B.E.s and R.E.s), and 23 were two-seater fighters (mainly F.E.s, Sopwith one-and-a-half strutters, and a few Bristol fighters). Most of the fighters were lone machines or had for some reason pulled out of a "dog fight." The Baron's first confirmed victory took place on September 17, 1916. His best month was April, 1917, when he shot down 30 machines in 30 days. By the time that the British had organised their formation flying, Richthofen, as a Wing Commander, rarely took part in a mêlée. He flew above it, directing his squadrons, and when

that work was done he would often dive on to a single machine which had pulled out and seemed to offer an easy victim. He was doing that when he was killed.

The figures of his kills are consistent with either theory of his fighting principles. He gave most of his attention to two-seaters, but whether this was because they were doing most harm to the German cause, or because they were so much cold meat to his fast, handy single-seater, does not clearly appear in this book. Guynemer regarded it as "simple murder" for a fighter to shoot down observation planes, but concluded that it was a military duty to destroy them. We have no inkling as to how Richthofen regarded the matter. Mr. Gibbons certainly suggests that to increase his own score was the chief thought in the Baron's mind. He once wrote that his Staffel was not out for records, but was merely doing its duty, but he may have thought that a correct sentiment for a Prussian officer to utter. Manfred called his brother Lothar a "butcher," because he attacked any plane within sight, instead of fighting on a deliberate plan. When Lothar was wounded, after diving to

attack a trench-strafting British fighter, Manfred said that his conduct was plain rashness.

It is not generally known that each of the Richthofen brothers was shot down twice, and yet lived to fight again. On March 9, 1917, an unknown British pilot put a bullet through Manfred's petrol tank, but Richthofen landed safely behind the German lines. Again, on July 6, 1917, Manfred's skull was grazed by a bullet from Capt. A. E. Woodbridge (who was killed last September in the disaster at Jask), of No. 20 Squadron, and the famous Prussian was in hospital for three weeks. Once, when Manfred was on leave, the Staffel was commanded by Lothar, who had his hip shattered in the fight mentioned above, but got down alive. In this same fight, Capt. Ball, V.C., was killed, and the German authorities gave the credit for this to Lothar; but this was probably done to magnify the name of Richthofen. On March 13, 1918, Lothar was again shot down and rather badly damaged. He was still in hospital when Manfred was killed. Lothar was credited with 40 victories and survived the war, only to be killed in a crash in 1922.

So far as Mr. Gibbons' narrative takes us, Manfred's chief fighting manoeuvre was the ordinary one of getting behind his enemy, underneath a two-seater's tail, or on top of the tail of a fighter. He was a good shot, but he would hold his fire until he was very close. He did most of his work in an Albatros fighter, which was far superior to any British machine of the time. In August, 1917, he began to use a Fokker triplane. Consequently, most of his victories were easy. He admitted that it was through the better climb of his machine that he killed Major Lanoe Hawker, V.C., on November 23, 1916. Of Hawker, Richthofen wrote, "I knew from the masterly manner in which he handled his machine, and the pluck with which he flew, that he was a wonderful fellow." He was a brave man, a sportsman, and a fighter." British officers who have survived encounters with the Baron have borne testimony to the latter's skill and courage. "Gosh," said Flight-Commander Woodbridge, "how he could fly!"

With the arrival of the Sopwith Camel at the front, the Circus began to suffer heavy losses. In March, 1918, the British destroyed 372 German machines, and shot down 205



Baron Manfred von Richthofen

* *The Red Knight of Germany.* By Floyd Gibbons, with drawings by Clayton Knight. (Cassell and Co., Ltd. 7s. 6d. net.)

more. On April 21 of that year, a general fight took place between a formation of Camels, led by Capt. Roy Brown, D.S.C., a Canadian of No. 209 Squadron, and two Staffels, of the Circus. Roy Brown was in a very bad state of health. He had evidently been too long at the front. He was scarcely able to eat solid food, but lived chiefly on milk and brandy. As a natural result, his nervous system was out of order. But while the great German advance was in progress, every British fighting man was needed at the front. Brown was a flight commander with 12 victories to his credit. He came from Toronto, and had first served in the R.N.A.S. But in the air he could master his nerves, and he was a cool and daring leader. Richthofen took part in the mêlée. There was one novice among the British, Lieut. W. R. May, an Australian, who had been expressly forbidden to join in a dog-fight. May shot down one Fokker in flames and then, obeying his orders, dived back for the lines. The Baron saw him and followed, chasing him down to 200 ft. off the ground and wounding him in one arm. Brown saw May's plight, dived on the tail of the Fokker, and shot Richthofen

through the heart just in time to save May's life. The Fokker landed upright behind the Australian trenches, near Sailly-le-Sec. The body was buried with full military honours. After the Armistice, it was taken back to Germany and given an impressive state funeral, which was attended by President Hindenburg.

The same afternoon, after shooting down Richthofen, Brown was out on offensive patrol again, and was in another fight. When he landed on his aerodrome, he collapsed in his seat and had to be sent to hospital. He was ill for six weeks, and was still an invalid when he went back to flying duty. Richthofen would have been the first to admire the indomitable spirit of the sick man who fought him and killed him. The Prince of Wales himself decorated Brown with a bar to his D.S.C. in recognition of his gallant victory. To-day, Brown is alive and well, engaged in business in Toronto. He deserves all the fortune which sometimes favours the brave.

There was not a stain on the escutcheon of Manfred von Richthofen. He was a great pilot, a great leader, a grim fighter, and a chivalrous victor. F. A. DE V. R.

MORE BOOK REVIEWS

AIR CRASHES FOR THE FILMS*

WE must hope that the whole of this book is not literally true. It resembles too closely a record of the Flagellants, or the Dancing Dervishes, or any other sect of people who voluntarily undergo torture for some special purpose. The "stunt-men" of Hollywood, who provide the crashes, accidents, and other gruesome thrills for film stories, do not, indeed, deliberately torture themselves. But what they do amounts to much the same thing, for they sign contracts to perform feats which must inevitably cause a high percentage of fatal accidents, and a still longer list of painful injuries. Compared with this picture of a stunt man's career, lion taming must be a safe and restful calling.

Almost invariably the stunt man acts as "double" for the star of the picture. The most horrible story in this book concerns a film in which a ballet dancer has her dress set on fire for the hero to extinguish. The author, Dick Grace, undertook to personate the girl in this scene. They poured gasoline and alcohol over his ballet skirt, and then threw a match at him. The petrol bath had evidently been overdone, for he says that flames leaped 18 ft. high above his head. They got them out somehow, and he recovered in hospital, only to go on to other dangerous stunts.

The stunt men spend a lot of their time in hospital; but according to this book they seem to have a greater indifference to pain than ordinary humanity can boast. Their recuperative powers must be phenomenal, and their nervous systems must be non-existent.

The author, Dick Grace, was a son of a Chief Justice of the Supreme Court of Northern Dakota. He studied law at the University of Minnesota. When America entered the war, he became a pilot in the U.S. Naval flying service, and was sent to France and Italy. He does not say that he saw much fighting, but he evidently became an extremely expert pilot. Then he became a stunt man at Hollywood, and ultimately came to specialize on aeroplane stunts. He contracted to carry out all the deliberate crashes for the film "Wings," and those crashes have made aeronautical experts in all countries rub their eyes and wonder how on earth the wonderful film was obtained. Grace, as a matter of fact, is no mean scientist, and he has worked out a system of crashing an aeroplane on a given spot in front of the cameras, and by means of that system he does not very often break his own bones. Yet once he miscalculated, and says that he broke four of his cervical vertebrae. Yet he recovered, and went on crashing machines. Then he organized a complete squadron of plane-crashers, which he called the "Squadron of Death." The reader may marvel, and many will disbelieve the greater part of the book. Yet the films can be seen, and seeing is notoriously believing, and if the book is horrible, it is still a book which, once started, must be read through to the bitter end.

* *Squadron of Death.* By Dick Grace. (Constable & Co., 7s. 6d. net.)

ROUND AFRICA IN A SINGAPORE*

ON November 17, 1927, Sir Alan and Lady Cobham and four others left Rochester in a Singapore flying-boat, and on May 31, 1928, they returned to Cattewater. The story of what they did and how they fared in the meantime is told in this book, published on St. Valentine's Day, 1930. In the circumstances, perhaps, it is natural that the book does not lay overmuch stress upon chronology. To tell the truth, this reviewer was somewhat surprised to see the book appear at all. In fact, having witnessed both the start and the arrival, and seen the very excellent film about the flight, it was without any great anticipation of special interest that he began to turn over the pages of this volume. He was somewhat surprised to find that he speedily became engrossed in what is a very fascinating narrative.

How does Sir Alan contrive to maintain the interest of his readers? Of actual adventures he has not met with very many. On this African flight he was delayed at Malta by the effects of bad weather, and on the Ivory Coast by mechanical troubles. Otherwise, he toured round Africa much as a man might drive a Baby car from Land's End to John o'Groats, and with about the same amount of incident. Of course, Africa is more varied and more picturesque than Great Britain. But, for one thing, most writers soon find their descriptive powers running dry when they try word pictures of place after place as seen from the air; and, for another, Sir Alan has described a flight from Croydon to Capetown before. The west coast, as seen from the air, has not before been described, but the author rather hurries over this part of the journey as if he found it less interesting. This is rather a pity. Yet despite all this, he has given a some what blasé reviewer a great deal of pleasure with this latest book.

Having paid this sincere compliment to Sir Alan's literary powers, the next step is to offer him some suggestions. One is that he should not, in the book describing his next great flight, overwork the word "wonderful," as applied to the hospitality which he is sure to receive. The second is that he should adopt the official Air Ministry definitions of the terms "aeroplane" and "seaplane." He always uses these two words as opposed to each other, as was once the general practice. That left one without any one generic term to describe all aircraft which are heavier than air. Most writers who have tried the (at best clumsy) term "heavier-than-aircraft," have found the printers turn it into "heavier-than-aircraft." The new terminology uses the word "aeroplane," as including the whole class; while the class is divided into "landplanes," "seaplanes," and "amphibians." This is much more convenient than the old method, and I venture to hope that Sir Alan Cobham will adopt it in future.

* *Twenty Thousand Miles in a Flying Boat.* By Sir Alan Cobham, K.B.E. (George G. Harrap & Co., Ltd. 10s. 6d. net.)

R.A.F. Chapel and Memorial

A CHAPEL was dedicated for the use of the Royal Air Force at Northolt Aerodrome, Ruislip, Middlesex, on March 9, by the Rev. R. E. V. Hanson, chaplain-in-chief to the Royal Air Force.

Air Chief-Marshal Sir John Salmond also unveiled a memorial tablet to Sqdn.-Ldr. A. G. Jones-Williams and Flight-Lieut. N. H. Jenkins, who lost their lives near Tunis last December while attempting a non-stop record flight from Cranwell to Cape Town.

PRIVATE FLYING AND CLUB NEWS

NOTTINGHAM is the latest town to form a Glider Club, and all those who are interested are advised to get in touch with Mr. M. A. Loglain, 18, Mansfield Road, Nottingham. This gliding business seems to have taken a firm hold, and queries regarding the construction of suitable machines are pouring in by every post. It is therefore advisable to point out one or two things which do not seem to be generally appreciated. The first is that gliders cannot be made of just any wood, or in any slipshod manner! The correct grade of aircraft material must be used, and the workmanship must be up to aircraft standard. Gliders, particularly those used for soaring, are subject to very large stresses, and consequently the same care must be taken in their construction as is taken with power-driven aircraft. The B.G.A. has settled a scale of factors which must be adhered to in order to obtain their certificate, which is almost the equivalent of a Certificate of Airworthiness, at least as far as the plans go. This should not be taken to mean that the construction of a glider is beyond any good carpenter, for it is not, but it certainly should be taken as a warning that the life of the pilot depends on using the material specified in the plans, and on the quality of the workmanship. The failure of a few gliders in the air, with the possible "sticky" result to the pilot, would do an incalculable amount of damage to the sport at this stage, and is to be avoided at all costs, even to the extent of deterring many would-be constructors from building their own machines.

THE LONDON AEROPLANE CLUB announce that all the tickets for the raffle of the "Moth" have been sold, and the draw will take place on March 23.

THE HAMPSHIRE AEROPLANE CLUB put up a total of 122 hrs. flying time for February, of which 41 hrs. 35 min. was dual, and 65 hrs. 15 min. solo by "A" pilots. This total puts them over 100 hrs. above the total at the end of February last year. The President of the Club, Lord

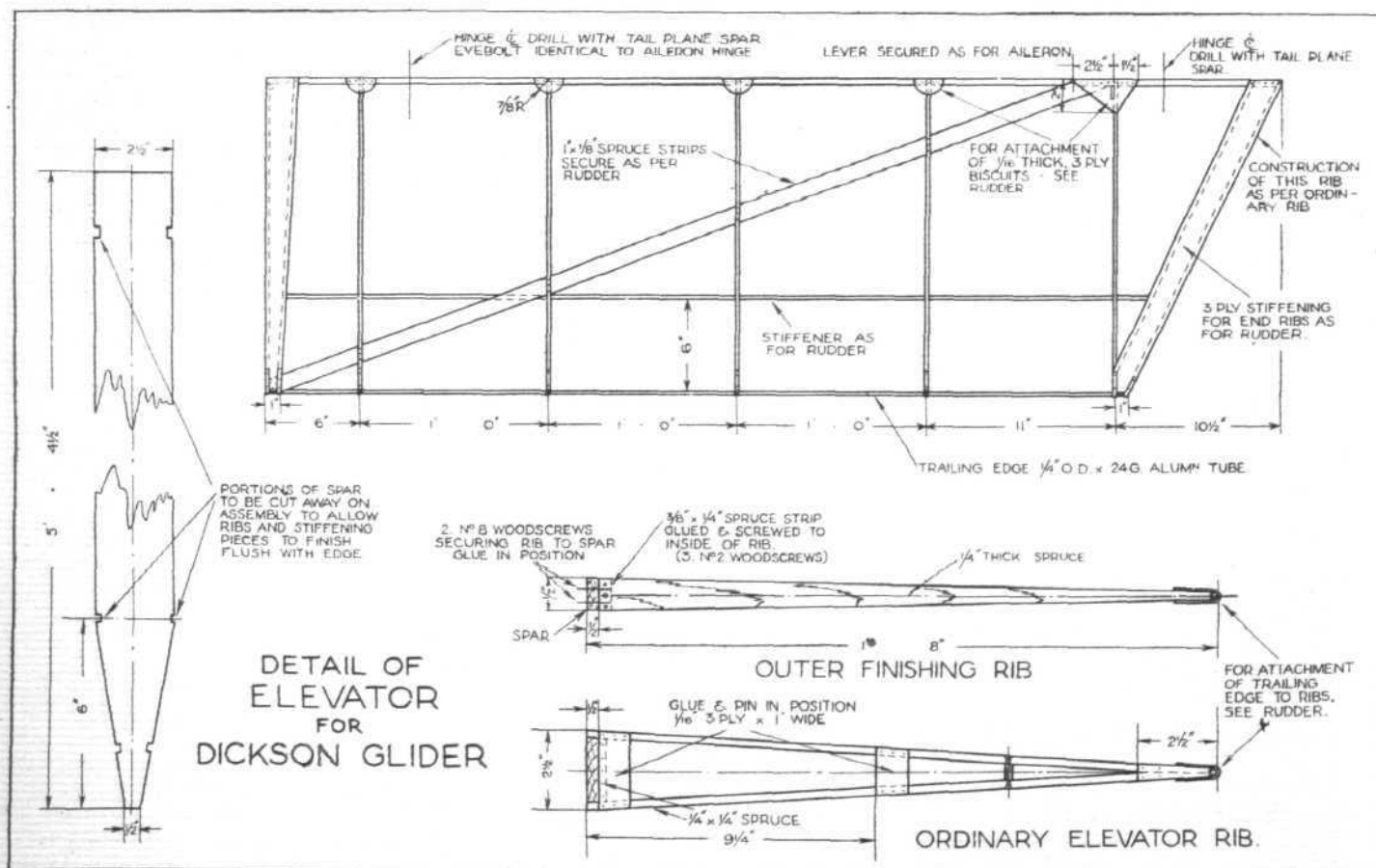
Louis Mountbatten is now flying solo, and we understand that both he and Lady Mountbatten have joined Hanworth Park Club, so that, no doubt they will fly from Hamble to Hanworth fairly frequently during the coming summer. It is rumoured that Lady Mountbatten is particularly interested in a three-engine cabin monoplane which she may purchase for her own use.

MISS SPOONER is reported to have been awarded the Women's Trophy of the International League of Aviators, the organisation run by Mr. Clifford B. Harmon, with its headquarters in Paris.

THE JOHANNESBURG LIGHT AEROPLANE CLUB flew 1,164 hrs. 5 min. during 1929, of which 475 hrs. were done solo by club-trained pilots. A large number of passengers, namely, 4,159, have been carried during the two years of the club's existence, all without a single accident.

THE BENGAL FLYING CLUB held an air gymkhana at Dum-Dum aerodrome on February 2. Over 2,000 spectators were present, and the number of Indians present showed how popular flying is becoming there. Capt. Warner and Mr. Trower did some very fine aerobatic flying, and there were also displays of formation flying, a landing competition, balloon bursting and bomb dropping. The day was wound up with a successful Thé Dansant at the club house.

SOUTH AFRICA is forming more and more light aeroplane clubs, and enthusiasm for flying is growing very rapidly. The Rhodesian Aviation Company are helping to form a club at Bulawayo, the Benoni Club have been helping to select an aerodrome at Parys, and in Durban they are now going to have a glider club. Of course, there are already many light aeroplane clubs in the Union, but it is pleasing to see that there is still this increasing interest in the matter.



THE DICKSON GLIDER: Above are the details for constructing the elevators for the Dickson Glider.

THE CINQUE PORTS FLYING CLUB only got in 8 hrs. 45 min. flying for the week ended March 8, as the fog has been very bad.

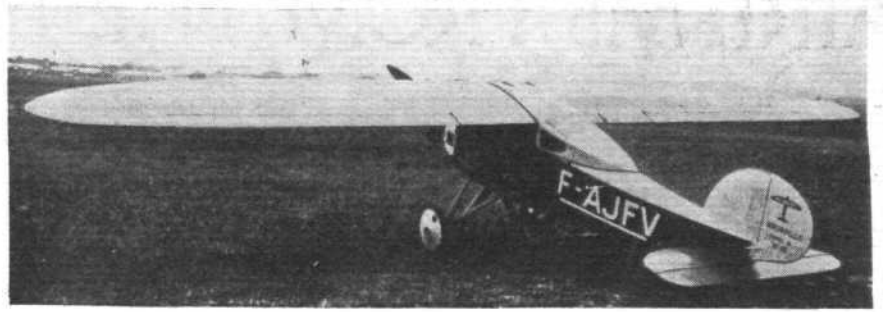
THE AIRCRAFT CLUB, HARROGATE, was treated to a lecture last week on the subject of gliding, by Mr. Gosling. Capt. Worral, of the Yorkshire Aeroplane club, was among the visitors, and he showed great interest in the development of the club.

WATER GLIDING is the latest form of amusement in America. A syndicate has been formed, and gliders with duralumin hulls, and having a low enough wing-loading to allow them to rise off the water when towed behind an ordinary pleasure motor-boat will be used. Air Associates, Inc., are seeing to the construction, and among those who will indulge in this towed form of gliding will be Frank Hawks, who holds the trans-Continental record on a Lockheed machine. Why not sit in a kite instead of paying for a dural boat?

"TIME MEANS MONEY" is the title of an attractive booklet extolling the D.H. Moth, a publication which may be obtained from the De Havilland works at Stag Lane.

CANADA'S FLYING CLUBS are growing both in numbers and keenness, and last year the 23 clubs flew 15,400 hours, which is equivalent to 1,232,000 miles and nearly twice the amount flown in 1928. The total membership of all clubs is 5,092, and at the end of the year there were 165 private pilots and 58 commercial pilots who had been trained from the clubs. It is regrettable that there were 11 fatal accidents and seven accidents involving injury to pilots or passengers, while in 1928 there were only three fatal and two minor accidents.

The club membership is as follows: Calgary, 1,060; Saskatoon, 745; Regina, 357; Toronto, 271; Hamilton, 198. With regard to flying hours, Winnipeg was first with 1,458, then Calgary with 1,224, Regina with 1,157, Saskatoon with 1,137, and Edmonton with 1,048. At the end of the



A RECORD BREAKER: An Albert (Genet). The altitude record gained was 7,730 m. (25,509 ft.) in the 3rd category, 350 kg. (771.6 lb.)

year there were 47 aircraft on loan from the Government to the clubs and 13 owned by themselves.

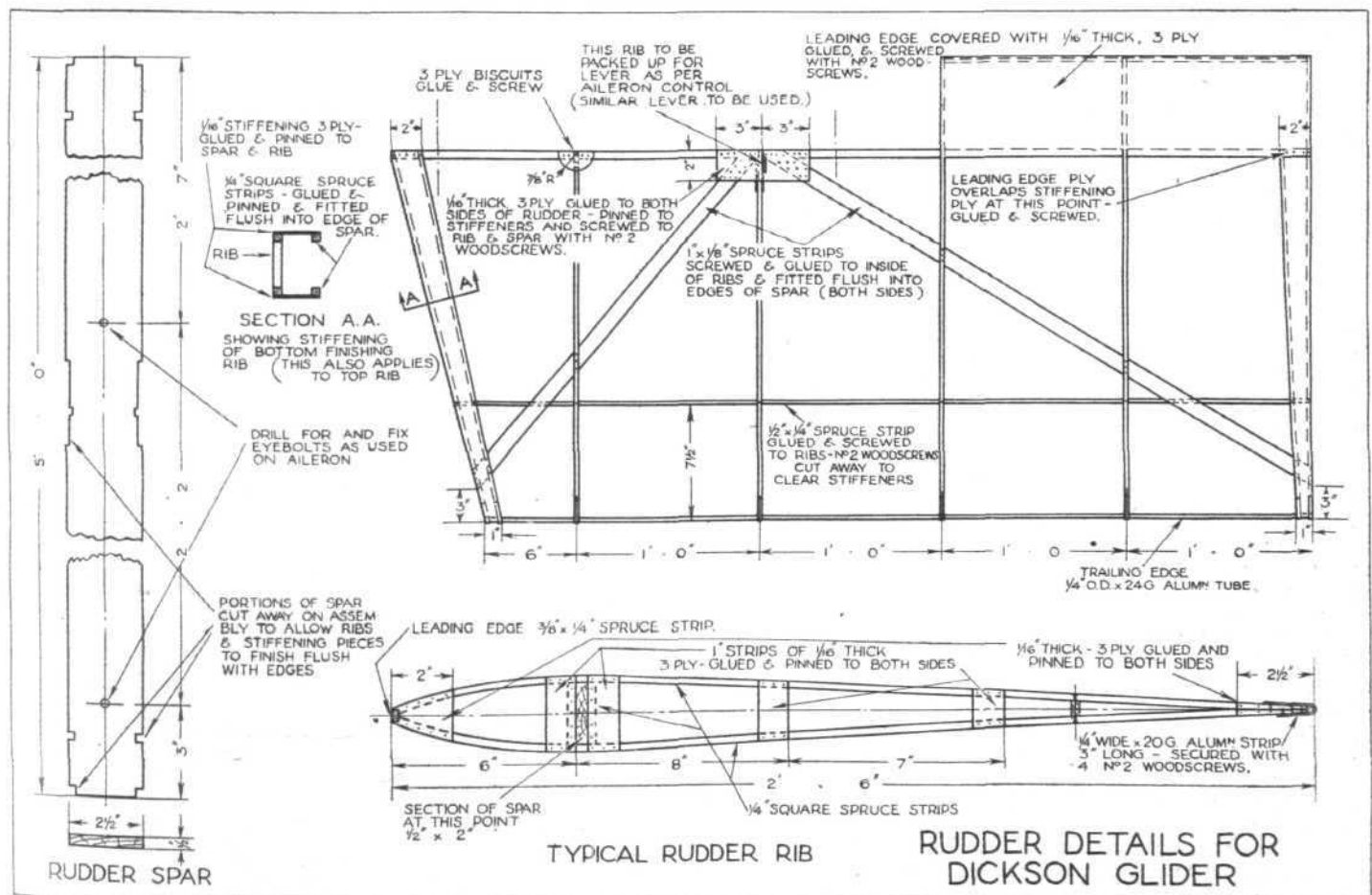
NEW ZEALAND is rapidly becoming keen on the private side of flying, and clubs are being formed at Morrinsville, Rotorua (aerodrome at Whakarewarewa), Te Awamutu, and probably at Te Aroha. Hamilton Airways, Ltd., will, in each case, run the clubs and supply the pilots.

THE SYDNEY UNIVERSITY GLIDER CLUB is being formed, and gliders will be built on a novel plan. The idea is that about a dozen members will each form a group and be responsible for finding the money, constructing, flying and repairing their own glider, by this means keenness should be sustained within the club.

THE DUNEDIN AERO CLUB has purchased a Simmonds Spartan (Hermes), and this machine is now being assembled. It will be the first in this part of New Zealand, and has caused quite a large amount of interest by its advent.

THE NORTH COTSWOLD GLIDING CLUB is being formed by Mr. H. Wright, of Evesham, and the B.G.A. is allocating a machine for them to start gliding on shortly.

HALTON AERO CLUB are building an elementary-type training glider, followed later by an advanced machine.



THE DICKSON GLIDER: Above are details for constructing the Rudder of the Dickson Glider.

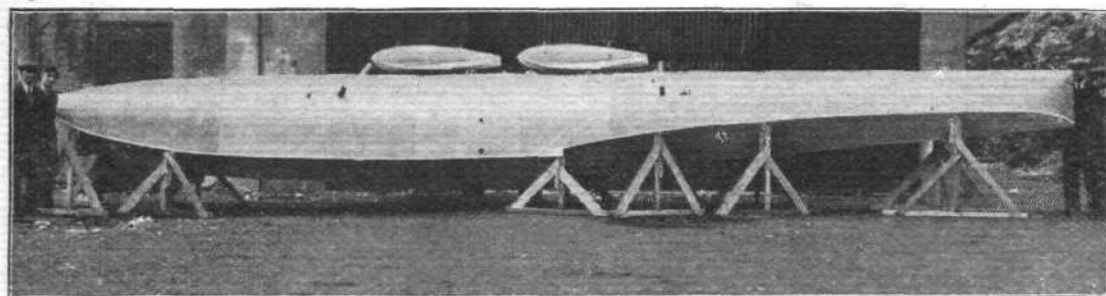
AIRISMS FROM THE FOUR WINDS

The Flight to Australia

SOME anxiety has been caused by the absence of news regarding Flying Officers H. L. Piper and C. Kay, who left Croydon for Australia on February 9 in a Desoutter cabin monoplane ("Cirrus Hermes"). They set out from Akyab for Rangoon on February 25, but up to the time of writing nothing more has been heard of them. Although they are more than two weeks overdue, there is hope that they are alive in some remote native village.

Mr. Van Lear Black

MR. VAN LEAR BLACK, who is flying to the East in a three-engined Fokker, piloted by Mr. Geysendorffer and Mr. Scholte, arrived at Akyab from Calcutta on March 11.



THE LONG AND SHORT OF IT: Extreme ranges of floats constructed by Short Brothers—the large float for the three-engined monoplane (40 ft. long, 22,600 lbs. displacement) and the wing-tip floats for the light amphibian (180 lbs. displacement each).

An India-England Flight

MR. R. N. CHAWLA, a member of the Karachi Aero Club, and Mr. S. P. Engineer, left Karachi on March 3, in a D.H. "Moth," in an attempt to reach Croydon in nine days.

Light 'Plane Mishap on Brighton Beach

A D.H. "MOTH," piloted by H. G. Linnell, with his brother, A. J. Linnell, as passenger, crashed on the beach at Brighton on March 8 and was damaged. The occupants, who had previously flown from France to Lympne and were on their way to Shoreham, were unhurt.

Bristol Engines for Sweden

THE Swedish Government has accepted a proposal by the Swedish Air Board for an agreement with the Bristol Aeroplane Co., of Filton, for the manufacture under licence of Bristol aero engines in Sweden for military aircraft.

Swiss Military Aircraft

THE Swiss Council of States has voted a sum of £750,000 for the purchase of military aircraft.

Karachi Airship Shed Completed

ON March 9 the Airship shed at Karachi, which has been constructed for the airship service between England and India, was officially completed by the insertion of the final bolt in the structure. The chairman of the Armstrong Construction Company then handed the shed over to Capt. Sawyer, the Air Ministry Representative at Karachi.

Amphibian for New York Police

A SAVOIA-MARCHETTI S.56 amphibian flying-boat was recently delivered to the New York Police.

D. Napier and Son

THE directors of D. Napier and Son, Ltd., announce that their annual report, which will be issued shortly, will show (subject to audit) that the net profits for the year ended September 30, 1929, amounted to £192,329 6s. They have decided to recommend at the forthcoming annual general meeting that (1) A final dividend of 2s. per share (less income tax) be paid on the ordinary shares of the company in respect of the year ended September 30, 1929, to the ordinary shareholders on the books of the company on March 23, 1930. (2) That a portion of the undivided profits be capitalised and applied in paying up in full, ordinary shares to be issued to the ordinary shareholders

registered on the books of the company as at March 23, 1930, in the proportion of three new ordinary shares for each ordinary share then held. (3) They also give notice that the ordinary share transfer books will be closed from March 24 to April 1, 1930, both days inclusive.

"Bristol Bulldogs" for Latvia and Esthonia

SOME months ago the Latvian Government took delivery of five "Bristol" Bulldog all-steel single-seater fighters fitted with the Jupiter Series VI engine, from the Bristol Aeroplane Co., Ltd. Since their arrival in Riga, the Latvian authorities have been delighted with the service and high performance obtained with these machines, whilst the "Bulldog" has also gained the whole-hearted approval of the

Latvian pilots, and the Latvian Government has now placed a further order with the Bristol Co. for seven additional Bulldog machines. Five of these will be fitted with direct drive Jupiter engines and two with supercharged Jupiters.

Esthonia, before deciding to adopt a new type of aircraft, watched with the closest interest the results obtained in the neighbouring State of Latvia with the "Bristol Bulldog." The results were so convincing, and the general quality in design and workmanship of the all-steel "Bulldog" was so marked, that the Esthonian Government decided that the "Bristol Bulldog" must be adopted as the new single-seater fighter for the Air Force, and an order has been placed with the Bristol Aeroplane Co., Ltd., for twelve of these machines.



SIR SEFTON BRANCKER IN GREECE: Air Vice-Marshal Sir Sefton Brancker recently visited Athens in connection with Civil Aviation developments and flew from Tatoi Aerodrome to Salonica in one of the Hawker "Horsleys" recently supplied to the Greek Naval Air Service. Our picture shows Sir Sefton (3rd from left) ready to leave, with Mr. A. C. Coutroubis (4th from left) and Capt. Voulgaris, Director-General of Ministry for Air (6th from left).

THE AIR ESTIMATES

THE Air Estimates for the year 1930* were issued on March 8, and show a net increase of £890,000 as compared with last year's Estimates. The Gross Estimate is £20,923,800, but appropriations in aid are expected to amount to £3,073,800, thus reducing the total for effective and non-effective services to £17,850,000.

The following table shows the net amounts required under the various votes, and we have added the figures for the last five years.

Vote	NET ESTIMATES.					
	1930	1929	1928	1927-28	1926-27	1925-26
1 Pay, etc., of the Air Force	3,731,000	3,323,000	3,401,000	3,160,000	3,405,000	3,412,000
2 Quartering, stores (except technical supplies and transport)	1,735,000	1,676,000	1,711,000	1,365,000	1,507,000	1,459,000
3 Technical and warlike stores (including experimental and research services)	7,596,000	6,585,000	6,567,000	6,424,000	6,091,000	5,650,000
4 Works, buildings and lands	1,720,000	1,700,000	1,700,000	1,900,000	2,347,000	2,572,000
5 Medical services	298,000	306,000	310,000	203,000	209,000	204,000
6 Educational services	493,000	498,000	504,000	507,000	432,000	486,000
7 Auxiliary and Reserve Forces	591,000	556,000	554,000	500,000	406,000	348,000
8 Civil Aviation	500,000	450,000	415,000	464,000	462,000	357,000
9 Meteorological and miscellaneous effective services	245,000	228,000	223,000	150,000	135,000	131,000
10 Air Ministry	675,000	661,000	657,000	687,000	761,000	751,000
Total effective services	17,584,000	15,983,000	16,042,000	15,369,000	15,755,000	15,370,000
11 Non-effective services (half-pay, pensions and other non-effective services)	266,000	217,000	208,000	190,000	245,000	143,000
Total effective and non-effective services	17,850,000	16,200,000	16,250,000	15,550,000	16,000,000	15,513,000

Personnel

The numbers of personnel to be borne on the establishment of the R.A.F. or attached thereto, exclusive of India, but including Aden:—*Air Officers*: Total, 38 (same as last year). *Other Commissioned Officers*: 3,300 (same as last year). *Cadets*: 127 (an increase of 15). *Warrant Officers*: 460 (an increase of 40). *Non-commissioned Officers*: 5,300 (an increase of 300). *Aircraftmen*: 19,375 (a decrease of 505). *Apprentices*: 3,400 (an increase of 150). Number to be voted: 32,000 (including Army personnel attached to R.A.F.) (same total as last year).

Financial Expenditure

Vote 1: Estimate of the sum required for pay, etc., of the R.A.F.:—Pay and personal allowances of officers, £1,221,000; Pay and personal allowances of airmen, £2,170,000; Marriage allowance, £136,000; Miscellaneous allowances and payments, £28,000; Civilians, £873,500; Service gratuities to airmen on discharge, etc., £1,200; Recruiting staff and expenses, £8,500. Gross total, £4,449,000. Appropriations in aid, £718,000. Net total, £3,731,000. Net increase, £142,000.

Vote 2, Accommodation allowances, £165,000; Barrack services, £59,000; Fuel and light, £215,000; General stores, £126,000; Clothing, £284,000; Provisions and horses, £617,000; Transport, £398,000. Gross total, £1,864,000. Appropriations-in-aid, £129,000. Net total, £1,735,000. Net increase, £59,000.

Vote 3: Technical and warlike stores provide for the following amounts:—Aeroplanes, seaplanes, engines and spares, £6,640,000; Experimental and research establishments, £165,000; Inspection services, £181,000; Aircraft technical and warlike stores, £179,000; Armament and ammunition, £381,000; Electrical stores, £221,000; Miscellaneous research and development, £283,000; Miscellaneous materials, £205,000; Balloons and hangars, £13,000; Mechanical and other transport, £314,000; Petrol and oil, £630,000; Rewards to inventors and miscellaneous claims, including war liabilities, £30,000; Airships (purchase of), £12,000; Airship development, £342,000. Gross total, £9,596,000. Deduct for probable underspending, £100,000. Appropriations-in-aid, £1,900,000. Net total, £7,596,000. Net increase, £642,000.

Vote 4, Works, buildings and lands, shows the following figures:—Staff for works services, £239,000; New works, additions and alterations amounting to £2,500 each and upwards £898,000; New works, additions and alterations under £2,500 each, £142,000; Ordinary repairs, renewals and maintenance, £496,000; Grants towards the cost of works, £35,000; Purchase of lands and buildings, £70,000; Rents, compensations and reinstatements, £27,000; Incidental expenses of Air Ministry estates, £13,000; Provision of telephone and telegraph services, £1,000; Miscellaneous works services, £10,000; Stores and plant for works, £22,000; Machine tools, £20,000. Gross total, £1,973,000; Deduct for probable underspending, £50,000; Appropriations-in-aid, £203,000; Net total, £1,720,000. Net decrease, £144,000.

Vote 5, *Medical Services*: Pay and personal allowances of officers, £137,000; Pay and personal allowances of airmen, £91,000; Nursing service, £23,000; Fees, etc., to civilian medical practitioners, £4,500; Civilians employed in hospitals and sick quarters, £18,750; Medical stores and supplies, £15,000; Payments to hospitals, £26,000; Miscellaneous charges, £2,750. Gross total, £318,000. Appropriations-in-aid, £20,000. Net total, £298,000. Net decrease, £8,000.

Vote	NET ESTIMATES.					
	1930	1929	1928	1927-28	1926-27	1925-26
1 Pay, etc., of the Air Force	3,731,000	3,323,000	3,401,000	3,160,000	3,405,000	3,412,000
2 Quartering, stores (except technical supplies and transport)	1,735,000	1,676,000	1,711,000	1,365,000	1,507,000	1,459,000
3 Technical and warlike stores (including experimental and research services)	7,596,000	6,585,000	6,567,000	6,424,000	6,091,000	5,650,000
4 Works, buildings and lands	1,720,000	1,700,000	1,700,000	1,900,000	2,347,000	2,572,000
5 Medical services	298,000	306,000	310,000	203,000	209,000	204,000
6 Educational services	493,000	498,000	504,000	507,000	432,000	486,000
7 Auxiliary and Reserve Forces	591,000	556,000	554,000	500,000	406,000	348,000
8 Civil Aviation	500,000	450,000	415,000	464,000	462,000	357,000
9 Meteorological and miscellaneous effective services	245,000	228,000	223,000	150,000	135,000	131,000
10 Air Ministry	675,000	661,000	657,000	687,000	761,000	751,000
Total effective services	17,584,000	15,983,000	16,042,000	15,369,000	15,755,000	15,370,000
11 Non-effective services (half-pay, pensions and other non-effective services)	266,000	217,000	208,000	190,000	245,000	143,000
Total effective and non-effective services	17,850,000	16,200,000	16,250,000	15,550,000	16,000,000	15,513,000

Vote 6, *Educational Services*.—Imperial Defence College, pay and allowances of R.A.F. instructor and contribution towards general expenditure, £3,400; R.A.F. Staff College, Andover, salaries, wages, and contingencies, £15,000; R.A.F. College and Electrical and Wireless School, Cranwell, salaries, wages and contingencies, £135,000; School of Technical Training (apprentices), Halton, salaries, wages and contingencies, £258,000; School of Technical Training (men), Manston, salaries, wages and contingencies, £22,600; School of Physical Training, Uxbridge, salaries and wages, £2,500; School of Store Accounting and Storekeeping, Kidbrooke, salaries and wages, £3,500; General and vocational training, £53,500; Miscellaneous educational services, £8,000. Gross total, £502,000. Appropriations-in-aid, £9,000; Net total, £493,000. Net increase, £5,000.

Vote 7, *Auxiliary and Reserve Forces*.—R.A.F. Reserve: (a) Pay and personal allowances of permanent staff, £4,400; (b) Pay and personal allowances during training, £15,200; (c) Retaining fees and reserve pay, £227,000; (d) Payments to civil companies for training courses, £175,000; (e) Miscellaneous expenses, £1,200; Special Reserve and Auxiliary Air Force, pay and personal allowances of H.Q. staff, £9,200; Special Reserve: (g) Pay and personal allowances of regular personnel, £68,700; (h) Training, £4,700; (j) Miscellaneous expenses, £1,000; Auxiliary Air Force: (k) Pay and personal allowances of regular staff, £46,700; (l) Grants to county associations, £21,200; (m) Training, £8,200; (n) Miscellaneous expenses, £3,600; University Air Squadrons: (o) Pay and personal allowances of instructors, etc., £4,000; (p) Miscellaneous expenses, £900; Voluntary Aid Detachments, £300. Gross total, £591,000. Appropriations-in-aid, £300. Net total, £591,300. Net increase, £35,000.

Vote 8, *Civil Aviation*.—Civil aviation aerodromes, £29,000; Air routes, surveys, etc., £23,000; Technical equipment, £16,000; Works, buildings and lands, £29,000; Miscellaneous, £2,000; Civil aviation subsidies, £448,000. Gross total, £547,000. Appropriations-in-aid, £47,000. Net total, £500,000. Net increase, £89,000.

Vote 9, *Meteorological and Miscellaneous Effective Services*.—Meteorological Services: (A) Salaries and allowances of the Meteorological Office, £53,500; (B) Salaries, wages and allowances of staff at Meteorological stations, £63,000; (C) Fuel, light and transport, £4,500; (D) Instruments, equipment, stores and research, £13,000; (E) Works services, £9,000; (F) Telegraphic, telephonic and miscellaneous charges, £13,700; (G) Superannuation, £1,800; Miscellaneous Effective services: (J) Compensation for losses, etc., £20,000; (K) Losses by exchange, etc., £300; (L) Payments to the War Office in respect of prison services, £1,500; (M) Telegraphic and telephonic charges, postage abroad, £60,200; (N) Miscellaneous, £21,500; (O) Allowances to ministers of religion, £7,000. Gross total, £269,000. Appropriations-in-aid, £24,000. Net total, £245,000. Net increase, £17,000.

Vote 10, *Air Ministry*.—Salaries of the Air Council, and Department of the Secretary, £319,100; Salaries of the Department of the Chief of the Air Staff, £120,300; Salaries of the Department of the Air Member for Personnel, £48,200

Salaries of the Department of the Air Member for Supply and Research, £142,800; Salaries of the Directorate of Civil Aviation and the Accidents Branch, £21,000; Pay of messengers, porters, etc., £25,700; Contingent expenses, £900. Gross total, £678,000. Appropriations-in-aid, £3,000. Net total, £675,000. Net increase, £14,000.

Vote 11, *Half-pay, Pensions and Other Non-effective Services*.—Rewards to officers, warrant officers, non-commissioned officers and aircraftmen, £350; Half-pay of officers, £6,000; Service and disability retired pay and gratuities of officers and nurses, £174,000; Wound pensions—officers, £550; Service and disability pensions and gratuities—warrant officers, non-commissioned officers and aircraftmen, £49,000; Pensions, gratuities and allowances to widows, children, etc., £20,500; Civil non-effective payments: recurrent charges, £8,400; Civil non-effective payments: gratuities and other non-recurrent charges, £7,500; Injury grants, £4,650; Commutation of retired pay, wounds pensions, etc., £15,000; Relief fund, £500; Compassionate grants, £50. Gross total, £286,500. Appropriations-in-aid, £20,500. Net total, £266,000. Net increase, £49,000.

MEMORANDUM BY THE SECRETARY OF STATE FOR AIR

THE net total of Air Estimates which Parliament is asked to vote for the coming year is £17,850,000. The estimated net expenditure for 1929, as revised to include the recent supplementary estimate of £760,000, is £16,960,000. There is thus an increase of £890,000. Appropriations-in-aid are up by about £20,000, and the variation on the gross figures is to that extent greater than on the net.

The experience of the present year, as reflected in the revised estimate, has shown that the "super-cut" (or over-head deduction to discount possible underspending) of £650,000 assumed in the 1929 Estimates, was altogether too large. Accordingly, in these Estimates it has been reduced to £150,000.

The following table shows the main features of the comparison (the original super-cut for 1929 disappears, having been absorbed in the revised figures for that year):—

	1930.	1929 (including supple- mentary estimate).	+ or -
True Gross (total of expenditure subheads) ..	21,073,800	20,013,100	+ 1,060,700
Deduct super-cut ..	150,000	—	+ 150,000
Gross Estimate ..	20,923,800	20,013,100	+ 910,700
Deduct Fleet Air Arm grant ..	1,267,000	1,067,000	+ 200,000
Deduct other Appropriations-in-aid ..	1,806,800	1,986,100	- 179,300
Net Estimate ..	17,850,000	16,960,000	+ 890,000

Owing to changes in the presentation of the Estimates in past years, the gross figures afford in some respects a better comparison than the net; and it is relevant to recall that five years ago the gross total of Air Estimates was materially higher than that now presented. Economies in the interval have enabled the figure to be reduced, notwithstanding the increase in the strength and activities of the Royal Air Force, the renewal of its equipment, the progress of civil aviation, and the numerous compelling claims of an advancing science and an adolescent service.

Generally speaking, these Estimates allow for a broad continuity of air policy, and in particular the outlines of the Home Defence Scheme are not prejudiced. For the coming year, however, the approved increases of the Royal Air Force are of small dimensions, and are designed to demonstrate once more the earnest desire of His Majesty's Government to avoid disastrous competition in air armaments. With this end in view, the consolidation of the existing units of the Home Defence Force will be the main feature of the 1930 programme, and the only new unit to be added to that force will be one non-regular squadron. We shall thus have a breathing space in which to watch the development of the new spirit which informs pacific international instruments, such as the Treaty for the Renunciation of War and the Optional Clause.

The increases in various votes, such as those on Vote 1 (personnel), Vote 2 (quartering, etc.), Vote 3 (technical material), and Vote 7 (reserves), are such as are consistent with this policy, and are indeed mainly consequential on existing commitments which could not be reduced without impairing the efficiency of the Royal Air Force and the safety of its personnel. The decrease on Vote 4 (works) indicates that the programme of capital expenditure under this head is being advanced by even more modest stages. The increase on Vote 11 (non-effective) reflects the growing incidence of retirement, which has hitherto been very low, as is natural with a new service. That on Vote 8 (civil aviation) corresponds with further anticipated developments in civil air transport. This increase is modest but is proportionately higher than the increase on the service votes.

Strength and Distribution of the Royal Air Force.—The present strength of the Royal Air Force is approximately 70 regular squadrons (including the equivalent of 12 squadrons in the Fleet Air Arm) and 12 non-regular squadrons. During the financial year 1929 the formation of one regular squadron for Home Defence, one squadron of flying-boats and four cadre or auxiliary squadrons has been put in hand; in addition, a torpedo-bomber squadron which was originally formed as an experimental unit has now been reorganised for normal service duties with a view to its proceeding to Singapore in the course of the current year.

In 1930 one flying-boat squadron and one cadre squadron will be formed, but the chief developments will be in advancing the equipment of the Force as a whole and of the units which were formed in 1929 in particular. Two new flights which were contained in the Fleet Air Arm programme for 1929, and were deferred, are now included in the programme for 1930.

During the past year No. 203 Flying Boat Squadron proceeded by air to Basrah, as forecast in the Air Estimates memorandum for 1929; the annual flight between Cairo and the Cape has been carried out with the co-operation of aircraft of the South African Air Force; and the long distance flight from Egypt to Nigeria has also been repeated, with, on this occasion, an extension to the Gold Coast.

It is proposed that a squadron of flying-boats should carry out a cruise in the Baltic during the coming summer.

Operational Activities During the Past Year.—The chief areas of activity have been in the Middle East and the Sudan. The disturbances which broke out in Palestine were by their nature primarily a problem for ground forces and 50 troops were transported by air from Egypt to Jerusalem within seven hours of the requirement being notified. Active reconnaissance and other protective duties were also carried out by aircraft of No. 14 Squadron, assisted by squadrons from Egypt, while for a short time reinforcements were provided by aircraft disembarked from H.M.S. "Courageous." The armoured cars of the Palestine Command, with temporary reinforcements from other areas in the Middle East, also assisted in restoring order.

In the Sudan, air action was enlisted to repel a rising by a section of the Nuba tribe which had organised armed resistance to government. This intervention was entirely successful and enabled a force of infantry to occupy the enemy's position without casualties.

In the Aden Protectorate, local unrest which had manifested itself by interference with traffic and robbery of caravans was quelled by air demonstrations and by the dropping of warnings.

A more serious situation arose towards the end of 1929 in Koweit, on the southern borders of Iraq. Two fighting tribes of Nejd had made incursions into the territory of the Sheikh of Koweit following an unsuccessful rebellion against King Ibn Saud, and stubbornly refused either to return to Nejd or to surrender to the British forces. In this case the threat of air action brought about the complete and unconditional surrender of the insurgents.

Personnel.—There has been an encouraging increase during 1929 in the number of applications for permanent commissions, both from the schools for cadetships at the Royal Air Force College, Cranwell, and from the universities for entry through the university commission scheme.

A revision has been made of the terms of enlistment of air-men. Aircraft apprentices and apprentice clerks who are entered at about the age of 16 for training to fill the technical and clerical trades respectively will as heretofore be recruited for 12 years' active list service, counting from the age of 18, with no reserve liability. The non-apprentice entrants, however, will in future be recruited for 8 years' active list service with no reserve liability, instead of for varying terms with reserve liability. A proportion will, of course, be allowed to extend their active list service to 12 years and to re-engage

to complete 24 years' service for pension. Those who are due for discharge after 8 years' service will be invited, up to the numbers required in the several trades, to enter the Reserve, and it is hoped by this means more effectively and economically to regulate the size of the Reserve in accordance with requirements from time to time.

Vote 1 shows a gross increase of £94,000, due principally to the increased number of airmen who will be entered for training and to miscellaneous increases in the civilians subhead. The net increase of £142,000 reflects not only the gross increase, but a diminished appropriation-in-aid in respect of Aden.

Training.—In 1930 for the first time the Armament and Gunnery School is giving an advanced course in armament for officers designed to fill posts requiring the highest degree of knowledge in this subject. A start has also been made with the training in torpedo work of officers required for this duty in the flying-boat and other squadrons allocated for coastwise defence. By the courtesy of the Admiralty this first course is being given in naval establishments.

Auxiliary and Reserve Forces.—The development of these forces has proceeded satisfactorily, the increase in the total of Vote 7 being accounted for chiefly by the expansion of cadre and Auxiliary Air Force squadrons. The strength of existing units has, generally speaking, been well maintained.

Excellent results continue to be achieved by the University air squadrons at Oxford and Cambridge, and the fact that solo flying in term-time is now permitted to members of these squadrons at both Universities has had the beneficial effect of enabling tuition in flying to be maintained without a break both in and out of term. Both squadrons have been maintained at full strength since their formation, and it is estimated that, on an average, each vacancy is applied for twice over.

Technical Equipment.—Vote 3 (Technical and Warlike Equipment) shows an increase of £642,000. This increase is principally due to provision of equipment for units formed in 1929, to the continued replacement of obsolescent types, and to an improvement of the position in regard to working stocks of equipment, which have been in danger of running too low for full flying efficiency.

The provision and use of parachutes at home and overseas is now universal, with the exceptions stated below, and experience has further demonstrated their value as a protection to the flying personnel. Parachutes cannot be carried in certain obsolescent types, which are in process of replacement, and their provision for sea-going aircraft depends upon the design of a quick release to enable the wearer instantly to disengage the parachute if he is still in his machine when it falls into the water: various designs to meet this requirement have been under careful investigation for some time, and it is hoped, in the light of recent trials, that a satisfactory type has now been evolved. Nineteen lives were saved by the use of parachutes during the past year.

By the autumn of 1930, forty-three regular squadrons at home and abroad, one cadre squadron, and five auxiliary squadrons, should be equipped with slotted wing aircraft. These units represent about half of the types (and much more than half the number) of aircraft in use by the Royal Air Force; the remainder include certain aircraft of obsolescent design and the fighter and flying-boat classes. Experiments are now being made with the fitting of slotted wings to both these latter.

Provision has been made for completing the replacement of the lighter types of motor transport, which was begun in 1928, and for continuing the replacement of obsolete heavy vehicles by six-wheeled types.

Additional provision has been made for torpedoes owing to the increasing amount of training carried out with this weapon.

The larger horse-power of engines now in use and the increasing amount of flying carried out lead to a corresponding increase in the consumption of petrol. Provision for lubricating oil is reduced as the result of the extended use of mineral oil which is considerably less expensive than castor oil.

Research and Technical Development.—The cost of research and technical development is shown in detail in Appendix 1 of the Estimates. The increase of £17,000 net over last year is attributable to the provision for new constructional work at the Royal Aircraft Establishment, Farnborough, apart from which other items would have shown a net decrease.

The Royal Aircraft Establishment was laid out during the war period when the demands upon it were very different from those now prevailing. The shrinkage of work after the war enabled certain buildings to be eliminated, but this process is not an economical means of dealing with the needs of a research and experimental establishment to-day. Present

requirements have therefore been carefully investigated in accordance with the latest methods of factory organisation, and as a result it has been shown that the expenditure of a capital sum upon regrouping the component workshops and renewing certain of the buildings will effect a considerable economy in time and labour. £41,500 has been provided for this reorganisation in 1930.

Provision is also included for commencing the construction of a large wind tunnel capable of containing the fuselage, engine and airscrew of an aeroplane at full scale. This will enable certain work to be carried out, such as the determination of the most efficient engine cowling and airscrew dimensions, which cannot be performed in any other way; and it will also permit accurate measurement of the air resistance of actual aeroplanes, under laboratory conditions instead of by repeated flights in the air, with a large economy of time and effort.

The variable density wind tunnel at the National Physical Laboratory which was put in hand in 1929 is expected to be completed and running during the coming year.

The programme of new aircraft comprises eight experimental types, service and civil.

The investigations of the Aeronautical Research Committee into the problems of noise in aircraft have reached a stage at which the volume of sound has been accurately computed; and its chief sources, the engine and the tip of the airscrew at high speeds, are now being attacked, simultaneously with an investigation of the best design and materials for cabin construction from the standpoint of sound insulation.

As an example of the progress made in engine design, it is interesting to observe that the Rolls-Royce engine with which the Schneider Trophy was won developed 1,900 h.p. for a weight of 1,526 lb. (0.8 lb. per h.p.), whereas the engine of the winning machine in the 1927 contest developed 900 h.p. for a weight of 928 lb. (1.03 lb. per h.p.).

Airships.—The two airships, R.100 and R.101 were both completed in the autumn of 1929. R.101 which was built at the Royal Airship Works, was brought out of her shed at Cardington in October, and carried out her first trial flights in that month. During November she remained at the mooring mast when not in flight, and rode through some very heavy weather without damage or strain.

R.100 was brought out of the Airship Guarantee Company's shed at Howden and flown at Cardington in the middle of December. After a second short flight she was transferred to No. 2 shed at Cardington for some minor modifications. In the latter part of January she carried out several flights, concluding with one of nearly 54 hrs., during which she flew over and round the whole of southern England and the adjacent seas.

It may be of interest to compare what has been done up to date with the programme laid down in 1924. The object of that programme was to build two airships of nearly double the size of any airship hitherto constructed in this country, with a much higher standard of passenger accommodation than had ever been attempted before, and with designs which were to be based strictly on the results of scientific investigations, and were to comply with definite and exacting safety requirements. It was also proposed that both airships should, as the last stage in their trials, carry out an extended voyage, for example, a flight to India and back via Egypt. The trials of R.100 and R.101 have shown that a satisfactory measure of success has been achieved, despite delays inevitable in a field so novel and experimental. Both airships have proved to be thoroughly stable and easy to control. R.101 rode at the mast through weather of exceptional severity (including gales with gusts up to 83 miles per hour) for a month on end, whilst R.100 has attained a full speed of about 81 miles per hour, which is as high as that of the Graf Zeppelin, an airship of much smaller diameter. On the other hand, owing to the unexpected difficulties met with in the development of the heavy oil engine, R.100 has had to be equipped with petrol engines, and is, therefore, not suitable for navigation in the tropics. R.101 is equipped with the first engine operating on the compression ignition system with heavy oil which has ever been used as a power unit in aircraft in this country; but owing to difficulties in the development of a variable pitch airscrew one of the airship's five engines has to be reserved for going astern, whilst the weight of the power system as a whole, is, and must, for the time being, remain, considerably higher than was estimated. Moreover, as has been explained to Parliament from time to time, lift has been deliberately sacrificed in order to incorporate certain other experimental features in this airship. The result has been that her useful load fell below that originally proposed. It has, therefore, been decided, in accordance with the policy of "safety first,"

which has been followed throughout, that an additional bay should be inserted in R.101 before a flight to India and back is undertaken, even though such a flight might well have been carried through successfully without this addition.

Provision is accordingly made in these estimates for this alteration to R.101, the construction of the necessary spares for both airships and the carrying out of a programme of oversea flights between now and April, 1931. The intention is that R.100 should in the late spring or summer carry out a flight or flights to the tower erected at Montreal by H.M. Government in Canada and during the winter should operate between Cardington and Ismailia. R.101 is to fly to India and back in the autumn, and will then be used for experimental operation on the Indian route. This is essential in order to obtain the data necessary before a commercial service on this route can be established.

Provision is also made for another important item, namely, the development of a mechanical means of moving large airships into and out of their sheds. It is very desirable, if airships are to be used for long distance services, that it should be possible for them to be moved in and out of their sheds as and when necessary without the large number of men required at present. In addition a small sum is provided, in order to avoid delay in meeting the possible requirements of the future, for further design work by the technical staffs both of the Airship Guarantee Co. and of the Royal Airship Works, in which the experience already gained in the construction and trials of the two airships will be utilised.

The total provision for the above services is £345,000 net, viz., £354,000 on Vote 3, subheads N and O, less £9,000 for appropriations-in-aid on subhead P.

Works.—The provision both for major new works already in progress and for those appearing for the first time is less than in 1929, the total decrease amounting to £109,000. The expenditure on purchases of land and buildings will also be considerably lower.

Pending completion of the negotiations with Egypt, only such works are being proceeded with outside the Canal zone as cannot be dispensed with even temporarily. In the Sudan necessary additions are being made to the accommodation already available for the squadron stationed there. Provision is included for the completion of emergency works in Palestine in connection with the disturbances in that country; the cost of these will be met from the Colonial and Middle Eastern Services Vote.

The only new stations on which work is to be commenced are one for regular squadrons in East Anglia, one for a non-regular unit in Northumberland (both deferred from 1929), and one for a non-regular unit in Scotland in replacement of an unsuitable temporary station.

The overall deduction made in accordance with the practice of previous years to discount unforeseen delays has been put at £50,000. The net total of Vote 4 is £144,000 less than in 1929.

Civil Aviation.—The increase in the Vote for civil aviation this year is mainly due to the provision for an additional net payment of £60,000 to Imperial Airways, Ltd., in respect of the inauguration of the imperial air service to South Africa. The section of the service between Alexandria and Mwanza (Tanganyika) should commence in the autumn of 1930, and the through service to Cape Town in the spring of 1931.

£348,000 has been included for subsidies to Imperial Airways, Ltd., in respect of their existing European services and of the service to Karachi. The latter service has now been extended to Delhi by the Government of India under arrangement with the company.

The existing agreements with light aeroplane clubs will, with two exceptions, terminate in the course of this year. I am able to announce that further financial assistance will be afforded to these clubs on precisely the same scale as that given to National Flying Services, Ltd. The amount required for payments to the clubs and to National Flying Services, Ltd., is estimated at £20,000.

Provision is made for portable floodlights at five aerodromes in the Middle East and in the Persian Gulf in order to enable flights by night to be regularly undertaken on the England-India air route.

It is proposed to proceed during the year with levelling and improvement of the surface at Croydon aerodrome.

Meteorology.—The expenditure on meteorology (Vote 9) shows an increase of £11,500 on that for the previous year, allowance being made for an anticipated increase in receipts of £2,000.

Additional staff is required for the meteorological service in the Middle East to enable it to provide the more extended service of forecasts and reports made necessary by the establishment of the Indian Air Mail.

During the past few years there has been great difficulty in meeting the ever-increasing demands for the services of trained meteorologists which arise from the development of aviation at home and abroad as well as from other causes. To meet these demands there is not available in the country any source of supply outside the Government service. It has therefore been decided to add six posts to the junior grade, where men who have taken the requisite university courses in physics or mathematics will receive systematic training in meteorology. There will thus be available a small reserve from which officers can be drawn to carry on responsible work arising from new developments.

A further increase arises from the establishment of a Port Meteorological Office in the London Docks to deal more effectively with the requirements of observing ships based on that port. London ships already form a large proportion of the 500 vessels that compose the fleet of voluntary observing ships, and it is anticipated that the proposals made in the international convention for the safety of life at sea will result in that proportion becoming still larger.

Air Ministry.—The rise in Vote 10 (Air Ministry) is due in the main to annual increments of pay on approved scales and to increased provision required for cost-of-living bonus.

A measure of reorganisation has been carried out in the department of the Air Member for Personnel. The work in connection with the posting of officers of the Royal Air Force and their selection for specialist courses and the maintenance of the appropriate strengths in numbers, ranks and qualifications at the various units has been growing in volume and intricacy with the expansion of the Force, and the staff dealing with these matters has had to be strengthened in order to cope with it.

The retirement from the post of Chief of the Air Staff on January 1 last, of Marshal of the Royal Air Force Lord Trenchard marks the conclusion of 12 years of independent existence of the Force. Since 1912, when he joined the then Royal Flying Corps, Lord Trenchard has devoted himself to the Air Service with a single-mindedness of purpose which deserves, and has received, the recognition not only of the Force which he has brought to so high a pitch of efficiency, and of the successive governments which he has so loyally served, but of the country as a whole. The Royal Air Force will always remember the inspiration and guidance which it received from him during the difficulties of its early years.

AIRSHIPS

THE development of a mechanical means of moving large airships into and out of their sheds" is the explanatory note given in the Air Estimates on the sum of £33,000 provided for new works under the airship development heading. The operation contemplated is as follows. When it is desired to move an airship from the mooring tower into a shed, the nose coupling will be unfastened and the ship will be held only on the mooring cable, which will be paid out as far as is thought necessary. A second mooring cable will then be dropped from the nose of the ship and will be secured to the new device. This device is a movable three-legged mast about 80 ft. in height, each leg of which is mounted on a caterpillar "castor." This mast is free to move in any direction, and is hauled about by a tractor. At the same time, the rear engine car will be secured to an independent truck and will be suitably trimmed.

The tractor will then drag the movable mast and the ship towards the doors of the shed. It will be necessary that the wind should be blowing more or less along the line of the shed. Two parallel railway lines will run into the shed, and on each of them there will be two trucks. Two guys will then be paid out from each side of the airship and will be made fast to these trucks. The guys will gradually be hauled in until the airship, still attached to the movable mast, is situated between the two lines of rail, held steady on each side by the four trucks. It will then be a simple matter to move the ship into the shed. It is hoped that the use of this method will reduce the size of the landing party required by about 90 per cent., and also that there will be few days in the year on which a favourable opportunity will not be found for moving an airship into or out of a shed.



AIR TRANSPORT

AERIAL 'BUS SERVICES

TEN-MINUTE and half-hourly aerial services between busy centres—similar to motorbus services—are an actuality in America. Furthermore, they are well patronised and are paying propositions. In America, they call them "Air Ferries," and it would seem that this form of air transport is likely to develop into a large and highly successful one.

It has generally been supposed that an aerial passenger service can only be a paying proposition when comparatively long distances are covered, when a considerable saving of time makes it "worth while" for the passenger. These "Air Ferries," however, show that, under certain conditions, short distance (from 5 to 20 miles) services, linking important cities or business centres with suburbs, etc., can be operated with successful results financially.

Thanks to our contemporary, *The Pacific Flyer*, we are able to give our readers a few particulars regarding the operations in this direction obtaining in America.

Some eight or nine years ago an unsuccessful attempt was made to operate a service of this kind, when Pacific Marine Airways started a service of seaplanes between Wilmington and Avalon Bay (about 30 miles). It failed, however, mainly because the terminals were not close enough to the towns—although during the summer it was well patronised by tourists.

Last year the Western Air Express took over the line, and operating two Loening six-seater cabin 'planes and a Sikorsky amphibian from their airport close to Los Angeles succeeded in drawing an increased business from the metropolitan centre. During the period from January 1 to October 31, the company carried 8,845 passengers from Los Angeles to Catalina—or nearly 30 passengers a day!

Mr. Vern Gorst was the next to attempt an Air Ferry service; after organising the Pacific Air Transport Co., and the contract air mail between Seattle and Los Angeles in 1927, he acquired two Loening amphibians in the hope of establishing an air mail line to Alaska. This latter scheme did not materialise, so Vern Gorst started the Seattle-Bremer-

ton Air Ferry, with a landing float at the foot of Madison Street (drawing passengers from the heart of Seattle) and a terminal point in the centre of Bremerton.

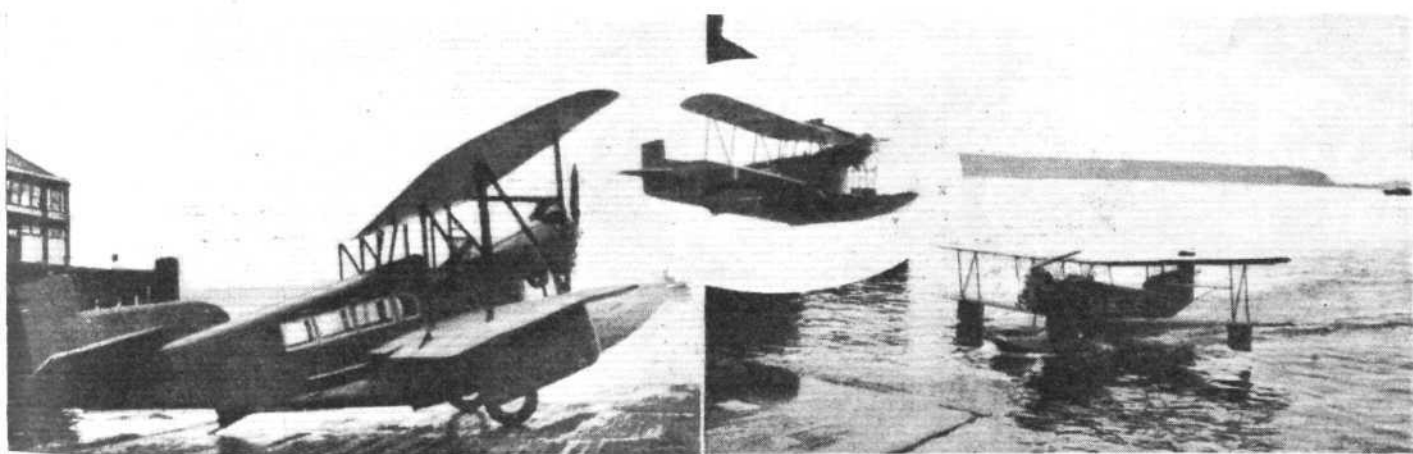
In the first two weeks 1,899 passengers made the 15-min. trip, which takes 1½ hr. by boat at a cost of 42 cents. Within five months Gorst Air Transport had carried 20,000 passengers at \$2.50 per trip—and recently the transport of freight, as well as passengers, has proved equally successful.

Now, a new venture of this kind has been launched. Air Ferries, Ltd., on February 1, inaugurated a 15-min. service between San Francisco and Oakland, with three Loening amphibians. This company, in addition, plans to operate regular and frequent services between San Francisco and the various bay cities—Berkeley, Richmond, Alameda, Vallejo and Marin, all separated by an annoying expanse of water.

The terminal points are all located in downtown districts of the various cities; at San Francisco the 'planes operate from Pier 5, close to the Ferry Building; at Oakland, they land at the foot of Franklin Street. This enterprise is, in other words, free of the expense of maintaining airports, and its passengers are landed directly at traffic centres and not on the outskirts of town.

'Planes fly between San Francisco and Oakland every 10 min., the fare being \$1.25 for the 6-min. trip. Operating with the same fare a machine will leave San Francisco every half-hour for Alameda and East Oakland, landing in 8 min. near the Park Street bridge. A half-hourly service to Sausalito will (landing close to the Golden Gate Ferry slip) take 6 min., whilst a 'plane will leave every hour for Richmond, landing in 8 min. in the inner harbour. The hourly service to Vallejo will take 16 min. and cost \$2.50, and two 'planes daily serve Sacramento over a 55-min. schedule with a fare of \$6.50. The trip to Stockton also will be made twice daily, the fare being \$6 and the time 50 min.

There is little doubt that these "Air Ferries" are profitable undertakings in America. Perhaps similar schemes might be tried over here—between Southampton and the Isle of Wight, for instance?



THE AERIAL 'BUS: The Loening amphibian, which is employed on the "Air Ferry" services operated in America.

Tribute to West Australian Airways

We quote the following from "Airways Bulletin," dated January 27, 1930. The extract calls for no comment. It runs:—

"The greatest and most genuine compliment that could ever be paid to any transport company was bestowed upon W.A. Airways recently by a British Insurance Group, the largest and most powerful organisation of its kind in the world. For years this group had endeavoured to secure the insurance business that this Company has given to various

Insurance Companies, but the normal rates quoted offered no special inducement for the Company to effect a change. With the advent of the multi-engined air-liners and the investment by the Company of over £100,000 in opening up Australia's largest and most important trans-continental service, the efforts of the British group were renewed. The group urged the Company to place its business with them, pointing out that history had proved that the Companies that had opened aerial routes in all parts of the world had met their worst troubles in the first six months, and that not



AN AUSTRALIAN-BUILT COMMERCIAL AEROPLANE : The Larkin Aircraft Supply Co.'s "Lascoter" monoplane (220 h.p. Armstrong Siddeley "Puma"). This machine is claimed to be the first commercial aircraft completely designed and built in Australia to receive a certificate of airworthiness. It is mainly constructed of metal, and with the "Puma" engine and disposable load of 2,000 lbs. has a speed range of 45-112 m.p.h., and a ceiling of 15,000 ft. A "Nimbus" or "Jaguar" engine can also be fitted in this machine.

one of them had been free from serious damage to machines. The Company modestly referred to its record of being the first organisation officially to secure 100 per cent. efficiency for its operations, and then decided to proceed with the inauguration of the large new service with its usual insurance cover, which was sufficient to protect it from serious loss. Those six months passed triumphantly, with all the mid-winter storms and night flying easily overcome by the carefully selected personnel and adequately maintained equipment of the Company. There then came a representative of the London brokers to view for himself the conditions under which these operations were conducted and to place before the Company the British group's special offer to take all the Company's insurance risks at the lowest aviation rates ever quoted by such a firm in any part of the world."

Western Australian Airways Statistics

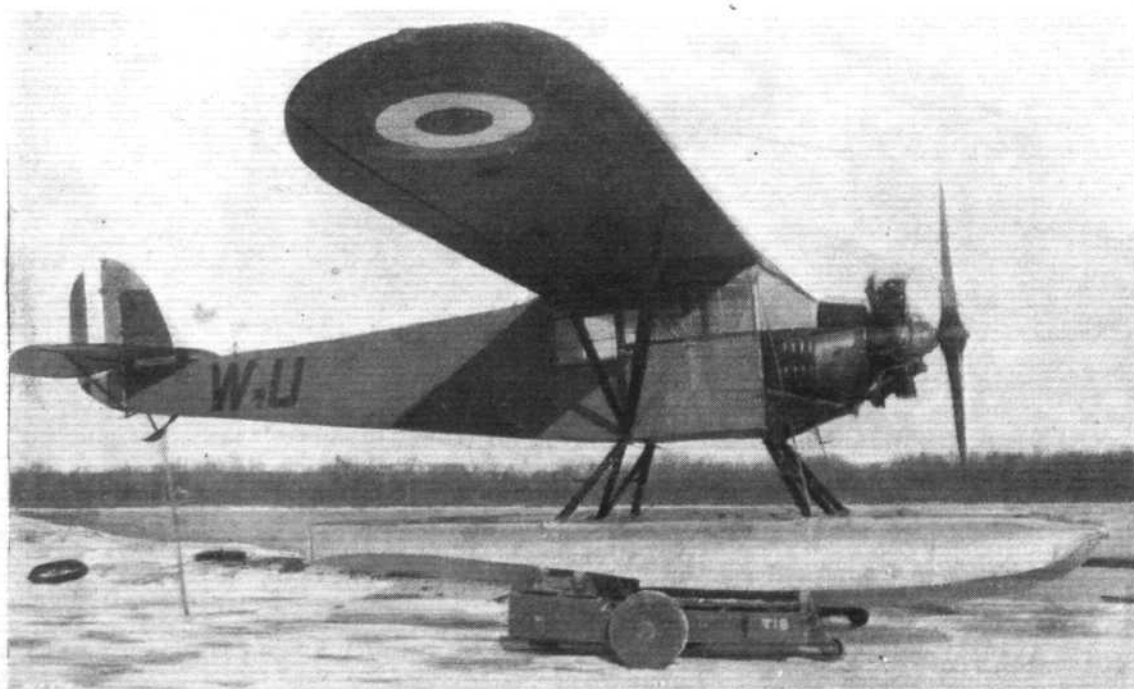
THE *Airways Bulletin* for January, 1930, gives the following statistics regarding the Western Australian Airways services up to January 27, 1930: Passengers carried (Perth-Derby), 7,080, (Perth-Adelaide) 2,240; taxi and joy-ride, 13,119. Machine flights, 9,872. Miles flown, 1,412,905. Letters carried (Perth-Derby), to December, 1,667,163;

(Perth-Adelaide), 28,699 lb. Freight carried: (Perth-Derby), 285,209 lb.; (Perth-Adelaide), 11,700 lb.

The *Bulletin* also records a good example of making up time by night flying. One week in January the mail boat from England arrived late in Fremantle, and so the *Hercules* with mail and passengers, could not leave for Adelaide until 4.20 p.m., instead of the usual 10 a.m. It pressed on, however, after night had fallen, landed by the light of flares at Kalgoorlie for dinner, and reached Forrest in the early hours of the morning. Adelaide was reached at schedule time on the day after leaving Perth.

Imperial Airways' Summer Services

IMPERIAL AIRWAYS announce that this summer there will be four services daily in each direction between London and Paris, and that the lowest fare (on the early morning service) will be reduced from £4 15s. to £4 4s. Additional aircraft will also be available when traffic is specially heavy. The services between London and Le Touquet will not operate, as the surface of the Berck aerodrome is unsuitable for heavy aircraft to land on. Light machines may be chartered for this journey at the rate of 5d. a passenger-mile. The summer services begin on April 13.



A FAIRCHILD IN CANADA : A side view of the Fairchild F.C.2 cabin monoplane equipped with an Armstrong Siddeley, "Lynx" geared engine. This machine, which carries a pilot and four passengers, can be fitted with floats, as shown, skis or wheels.

ENGINE LECTURES AT THE R.Ae.S.

Six Years' Progress of Water-cooled Engines, by A. J. Rowledge; Resistance of Air-cooled Engines, by Major F. M. Green; The Townend Ring, by H. C. H. Townend

THREE papers were read before the Royal Aeronautical Society recently, which were not only of surpassing interest, but which were, either by design or coincidence, complementary. On February 27, Mr. A. J. Rowledge, Rolls-Royce's chief designer, read a paper entitled "Water-cooled Aero Engines (Six Years' Progress)," and on March 6, Major F. M. Green, chief engineer of the Armstrong Siddeley and Armstrong Whitworth concerns, and Mr. H. C. H. Townend, inventor of the "Townend Ring," read papers on "Resistance of Air-cooled Engines" and "The Townend Ring," respectively. Had space permitted, we should very much have liked to publish these papers in full. That, however, is impossible, and readers are referred to the Journal of the R.Ae.S. for a full report. We cannot hope to do more here than give a very brief summary of the papers.

Mr. Rowledge dealt, in his paper, mainly with the results of the intensive development work done at the works of Rolls-Royce, Ltd., during the last six years (*i.e.*, since he read a paper on water-cooled aero engines before the Institution of Automobile Engineers). The competition, he said, between water-cooled and air-cooled engines had resulted in the better performance of both types. Reliability was the first and most important quality, and was difficult to hold in the face of a desire to give performance. A distinction should be made between reliability and length of life, or length of time between overhauls. They should put safety first, but did not think the commercial user unreasonable when he demanded in addition a fairly good running period between overhauls, and a long life for the major components of his engine. When considering this point, it might be remembered that the better control of cylinder temperatures in water-cooled engines enabled an overload to be carried safely. This was particularly important in multi-engined aircraft, where the remaining engines in case of failure of one must be capable of carrying the additional load in an emergency.

A comparison of costs was more difficult than one might expect, due to the fact that it was useful horse-power that mattered. As regards running costs, the water-cooled engine had the advantage in lower fuel and oil consumption. In the matter of cost of overhaul, it was generally held that the air-cooled engine was an easy first. He thought the next six years would see a swing of opinion towards the water-cooled. They were always being told how easy it was to change a cylinder on a radial air-cooled, but it had been shown that with a modern water-cooled it was possible to change a complete cylinder block overnight.

On the question of performance, figures such as a maximum aircraft speed of 357.7 m.p.h., an engine giving 1,900 h.p. for a weight of 1,530 lb., or 0.805 lb./h.p., or, taking the maximum power attained on the test bed, a weight of only 0.75 lb./h.p., showed that very considerable progress had been made, and these figures were thought to be capable of improvement when there was an opportunity to carry out a little more development work. Comparing those results with the standard rating of the Rolls-Royce "H" engine of 825 b.h.p., which had the same cylinder capacity, showed how necessary restrained judgment was in deciding the balance between reliability and performance, and at the same time pointed the direction and distance they had available for further improvement. There was evidence to show that development would be in the direction of relative reduction in cylinder capacity on a given crank, with higher mean effective pressures and rate of crankshaft revolutions.

If one looked at figures for engines that had passed the Air Ministry type tests, one found that a naturally-aspirated engine at its rated power had a B.M.E.P. of 133 lb., while a moderate supercharger engine had a B.M.E.P. of 143 lb. at its rated ground b.h.p. The weight of these engines per b.h.p. at ground level was 1.76 lb. and 1.71 lb. respectively, or 1.6 and 1.56 at maximum power. These figures referred to geared engines complete with all accessories. The advent of the supercharger had given them an engine with a B.M.E.P. of 130 lb. at 11,500 ft., for a weight at that altitude of 1.88 lb./h.p. compared with a figure of 90 B.M.E.P. and 2.62 lb./h.p. for a normal engine under the same conditions. On a capacity basis the normal engine showed a figure of 37.8 b.h.p. per 100 cub. in., and the moderate supercharger 40.5.

These figures were at normal rated h.p. At its maximum power the Schneider engine had a figure of nearly 90 b.h.p. per 100 cub. in.

Six years, the lecturer said, had seen the gradual triumph of air-screw reduction gearing for air-cooled engines, and the practical application of the gear-driven supercharger. The more general adoption of airscrew gearing had been followed by an increase in crankshaft revolutions as well as the adoption of more suitable airscrew speed. The lecturer would like to see more attention paid to the three-bladed airscrew for smoother running, and if a variation of gear ratios was needed, he thought it well worth while. The radial engine generally used the epicyclic type of gear to keep the airscrew coaxial with the engine. On vee engines, on the other hand, simple spur gearing was more often used so as to bring the airscrew into a better position. The success of the gears was largely due to the very accurate grinding of the teeth, which allowed the stress to be carried by more than one tooth. Pressures per inch of tooth face as high as 3,400 lb. were found, with pitch line velocities as high as 3,200 ft./min.

The lecturer thought the next six years should see the general adoption of evaporative cooling, with or without the general adoption of a fluid other than pure water as the cooling medium. Enough experimental work had been done to make the success of such a system quite certain. This system was the answer to the reduction in resistance obtained recently in air-cooled engines by improved cowling. He assumed wing condensers would be used. Evaporative cooling gave automatic temperature regulation, and a higher B.M.E.P. could be obtained with less detonation and better fuel economy. Ethylene-glycol gave a small radiator owing to the increased temperature difference between the liquid and the air. At some future date the automatic mixture strength regulation would be universal, and the pilot would then be relieved of the responsibility of remembering his radiator control before the water had boiled dry. The variable pitch airscrew was making some progress, but had not yet passed the experimental stage. If it came into general use it would have considerable influence on engine design by developing a tendency to keep up engine torque and keep down engine revolutions when cruising. Most engine builders disliked that combination, as the engine would have a harder time.

With the general increase in engine accessories they were bound to consider which could be left off, and whether they could modify conditions so as to get performance with a simpler engine. Greater range of engine speeds was one such question. He thought it must be admitted that if they could take off and cruise at normal revolutions per minute and that their engines would stand bursts of high speed without mechanical failure, then an increase in range of revolutions per minute would reduce the usefulness of the variable-pitch airscrew. To get the best results they would have to have a very good throttle consumption curve.

The most important development of recent years, where service aircraft were concerned, was the application of the geared centrifugal blower to supercharge the engine cylinders, either to restore ground power at height or to ground boost. They had run the rotors up to 32,500 r.p.m., and on the 11,500 ft. supercharged engines the speed was 27,000 at the maximum permissible engine speed. In this country the carburettor was placed on the suction side of the blower. This kept the float chamber low, assisting in gravity feed. The vaporisation of the fuel increased the efficiency of compression, besides helping with the aid of the mechanical effect of the rotor to pass a uniform mixture to the engine. The exhaust-driven blower seemed likely to die right away. Mr. Rowledge explained briefly the terms "supercharging" and "ground boost," pointing out that there was really no difference between them. Supercharging was the expression used to denote restoring the ground h.p. at some height, while ground boost was used to get increased power at ground level. The chief difference lay in the fact that the "supercharged" engine was not mechanically strong enough to stand full throttle near the ground.

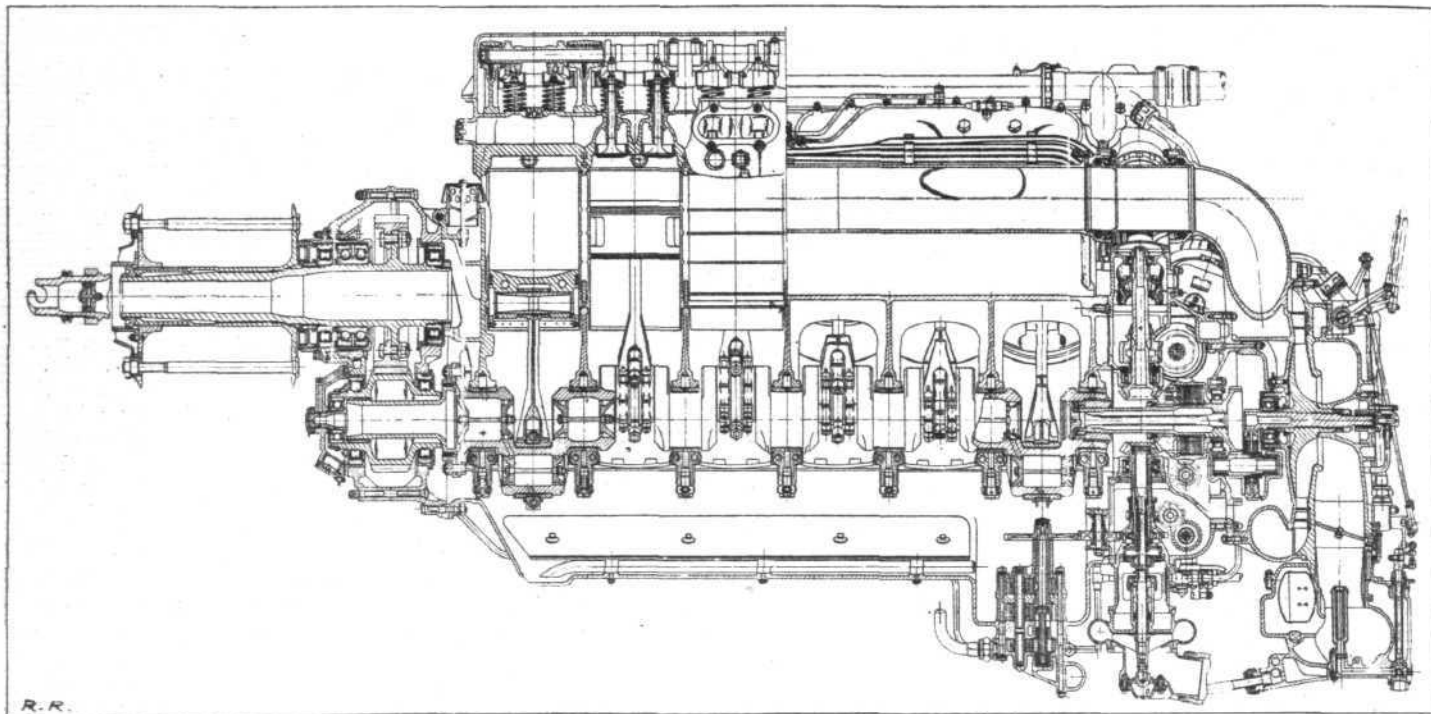
A simple device had been developed by the Rolls-Royce company, which was really another form of supercharger. It was in the form of an expanding air intake, and advantage was taken of the fact that the speed of the aircraft was

usually greater than the air velocity in the usual type of air intake. The mouth of the air intake was arranged to take in a slice of air without spilling, and the velocity was reduced in the expanding pipe, to be converted into pressure energy. It was, in fact, the cheapest and also the lightest means yet found of increasing the power of an engine.

Real progress had been made with fuel economy, but for commercial aircraft they could not depend upon the use of special fuels. Fuels could now be obtained which permitted of running at 200 B.M.E.P., using high boost and fairly high compression, but for commercial work they had to be

beyond a certain pressure, while the former required a separate relief valve. Finally the lecturer referred briefly to the improvement in materials that had taken place.

In his paper on "Resistance of Air-Cooled Engines," Major F. M. Green started with the subject of cooling rather than with that of drag, as these two are closely bound up with one another. The number of heat units per h.p. which had to be transferred to the cooling air depended only to a very slight extent upon the arrangement of the cylinders.



Longitudinal sectional view of the Rolls-Royce supercharged Type "F" engine.

content with a B.M.E.P. of about 130 lb. The Air Ministry now allowed a certain amount of detonation with standard fuel if the engine could stand up to a 20 hours' run in addition to the standard type test, with the engine speed pulled down to ground running conditions and developing full power at that speed.

When complete reliability had been achieved, engines would have to become more silent in operation. This was the point where, perhaps, least progress had been made during the last six years.

Mr. Rowledge then turned his attention to the subject of frontal area, pointing out that high mean effective pressures and increased engine speeds had helped to reduce frontal area. To illustrate how area had been reduced, he showed slides of the "Condor" and "H" engines.

Concerning the Schneider engines, the "R" type, Mr. Rowledge said the bore and stroke was the same as in the "H" engine, namely, 6 in. and 6½ in. respectively. But practically every part of the engine was different. The camshaft covers were shaped to conform to the body shape of the aircraft. The air intake was between the cylinders and was of the expanding type previously referred to. The time available for producing the "R" engine was very limited. Fortunately, they had done some running experimentally on the "F" type engine at nearly 200 lb. B.M.E.P. and at high speeds. Similar experiments were made with an "H" engine, while the design of the "R" engine and of the aircraft proceeded. On their final tests they had a 300 m.p.h. wind blowing over the air intake, provided by a blower driven by an "F" engine. This was done to test the diverging air intake under conditions approaching those obtaining in the actual racing machine. An additional blower, driven by another "F" engine, was used for cooling the racing engine. One of the outstanding virtues of the racing engine was its ability to run slow without plug trouble. The "R" engine was also a full-scale test of ground boosting, and the results clearly showed that a considerable ground boost could be used satisfactorily.

Engine-driven fuel pumps were an accepted accessory to-day. The two main types were the gear type and the diaphragm type. The latter could be arranged not to pump

Whether these were radial, in-line, or in vee made no real difference. Fixed radial air-cooled engines were developed at the same time as the rotary, but had little success, due chiefly to the low aircraft speeds of the early days. Having both wind tunnel and full-scale test results of them, he took as examples the 14-cylinder "Jaguar" and the 5-cylinder "Genet."

Of model test figures at 100 ft./sec., we quote the following:—The drag of the "Jaguar" by itself was between 70 and 80 lb. The drag of a typical two-seater without wind-screens was 20 lb. The drag of the body plus unfaired engine was 55 lb. Adding a spinner to the airscrew reduced the drag to 45.4 lb. Adding cowling over the gap between spinner and engine made very little difference. Fitting a "Townend ring" round the engine reduced the drag of body plus engine to just over 30 lb. The shape of the ring was fairly critical. The most practical was found to be a thin ring of aerofoil section. Full-scale tests with a "Siskin" showed that the increase in speed expected from wind tunnel tests was actually obtained. The increase in speed varied from 5 to 3 per cent., according to height.

The power taken for cooling the engine at 100 ft./sec. was only 1.8 h.p. At 200 ft./sec. it was 7.2 h.p. Making allowance for effect of slipstream and airscrew efficiency brought the figure up to 9.6 h.p., which was equivalent to 4.2 per cent. of the power of the engine.

The size of body in relation to engine diameter was of considerable importance. Fortunately, this size was not very different from what had been found necessary from other considerations. Recent tests indicated that minimum body drag was obtained with a body slightly bigger than used on the Siskin, Atlas and similar aeroplanes. The actual measured drag had been as low as 20½ lb. with a body nearly circular in section with a Townend ring, and 55 in. in diameter. These figures related to the "Jaguar."

In the case of the "Genet," results of a similar character were obtained. On a model of an "Avian," the engine, with most suitable cowling, increased the drag of the body at 100 ft./sec. by only 3 lb. This was very little, being less than one-seventh of the drag of the undercarriage, or about the same as the drag of a good windscreen. An increase in speed of

4 per cent. did not sound very much, but it should be remembered that it corresponded to a decrease in horse-power at the same speed of about 10 per cent. In other words, by using a Townsend ring one could carry 10 per cent. less fuel and work one's engine at 10 per cent. less of its full power.

It was surprising how difficult it was to make a cowl which would not crack under the combined effects of air forces and engine vibration, and the Townsend ring was far and away the simplest arrangement likely to work. And even that gave a good deal of practical difficulty in construction until a good form of construction was found.

Mr. Townsend, in his paper, "The Townsend Ring," related the steps by which he had arrived at the ring as we now know it. The invention arose out of experiments connected with a different problem altogether, and the ring to reduce engine drag was but one application of the principle. The first experiments related to rings of roughly streamline section placed over the nose of an airship hull form. Next came experiments with straight struts, with which the distance from the body could more readily be varied. Results of a similar character were obtained. Spoiling the shape of the nose with an excrescence to represent an engine in a fuselage, the changes in drag by fitting the ring were similar but, of course, much greater than in the case of the smooth airship hull body. The logical development then was to proceed to tests of the ring on models of fuselages with radial engines.

Tests were made with the ring placed in various positions, behind and in front of the cylinders. The important fact was established that the important feature in a ring was that its section should be working at a fairly high lift coefficient, and it seemed probable that better results might be obtained if the section was chosen to have a high lift coefficient, rather than a low drag coefficient.

The first model tests, using models in which "realism" was introduced by the inclusion of a good deal of detail, were made on a model of the Short "Crusader" with Bristol "Mercury" engine built for the Schneider contest. With the ring, testing body and engine only, there was a reduction in drag of 34 per cent. With the complete model the absolute reduction was slightly greater and corresponded to a percentage reduction on the whole machine of 20 per cent. At 5 degrees incidence of the whole machine the L/D was increased from 6.2 to 7.6.

Tests made with different numbers of cylinders from 3 to 9 showed that the percentage reduction in drag increased with the number of cylinders up to 9. A model "Siskin" with 14-cylinder "Jaguar" was then fitted with rings. The best results were obtained with rings of cambered plate section, reductions of just over 50 per cent. being obtained. The next step was full-scale tests on a Bristol "Bulldog" with "Jupiter" engine, a scale model of the machine being made

for purposes of comparison. An airscrew was fitted to this model, and tests made over the full range of $V/\mu D$. With a ring of cambered plate section having a chord of 16 in. (full scale) a drop in drag of 60 per cent. was obtained. The ring, in these tests, was a polygon, *i.e.*, not of circular shape, but this fact made very little difference, although the circular shape was probably slightly superior.

A ring of thick symmetrical section was found fairly sensitive to its position in relation to the cylinders. Anything tending to stall the section should be avoided, and for this reason projections such as valve covers should be faired into the ring.

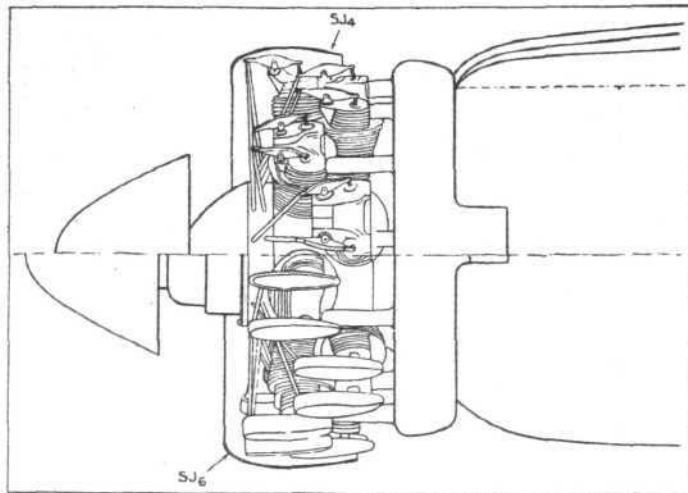
In summarising the results of varying the characteristics of the ring, Mr. Townsend said that thin cambered plate sections generally gave the best reduction in drag. If, however, the ring was wanted also to collect the exhaust gases, it was quite possible, aerodynamically, to obtain a pretty good drag reduction with a *thick* symmetrical section. The reduction in drag increased steadily with increase in chord up to 12 in. or 14 in. (full scale). The further improvement of going to 16 in. was slight. The best results were obtained with cambers of 9 to 10 per cent. of the chord for thin sections. With symmetrical sections the really thick ones appeared better than the moderately thick. It was not possible to

give a definite value for the best angle of the chord line to the body axis, as it depended on the shape of the nose. The angle should be such that the angle to the *local* wind stream gave a fairly high lift, without, however, approaching too close to the stalling angle of the section.

For a ring having a chord of 12 in. the plane of the trailing edge should be situated close to the centre line of the cylinders. The trailing edge diameter should not be greater than the diameter of the engine.

In conclusion, Mr. Townsend said: "Full-scale tests with sections which, in addition to being less sensitive, were easier to fit without modification, have been fairly consistent in bearing out the results of these model tests. In particular, tests both at Armstrong Whitworth Aircraft, Limited, and at Martlesham Heath have shown an increase in speed of about 7 to 9 miles an hour on a Siskin "Jaguar" machine. Other results include satisfactory tests on a light machine with 5-cylinder engine and an increase of nearly 5 m.p.h. on a large twin-engined machine with interplane engine nacelles.

A further result which may be mentioned is that of a twin-engined monoplane having a Lynx engine on each wing. In addition to the reduction of engine drag which produced an increase of 7 m.p.h. near the ground, in this case the maximum lift of the wings was also improved, the joint effect giving an increase of several thousand feet on the ceiling. Without the rings the disturbance over the wings caused by the engines was very considerable, enough, in fact, to render the original performance quite inadequate for the work for which it was designed."



Details of nose of "Siskin Jaguar" model, showing two types of ring, SJ4 and SJ6.



Principal Air A.D.C. to the King

THE Air Ministry announces the appointment of Air Marshal Sir Edward Leonard Ellington, K.C.B., C.M.G., C.B.E., as Principal Air Aide-de-Camp to the King (*vice* Air Chief Marshal Sir John Maitland Salmond, K.C.B., C.M.G., C.V.O., D.S.O.). Air Marshal Sir Edward Ellington is Air Officer Commanding-in-Chief the Air Defence of Great Britain. He succeeded Air Chief Marshal Sir John Salmond in this command on January 1, 1929.

The Byrd Expedition Returns

THE Byrd Antarctic expedition arrived back at Dunedin on March 10, and received a most enthusiastic welcome. After the official reception Admiral Byrd said: "Having been attended by good luck, we accomplished all we set out to do, and perhaps a little more. We are mighty glad to have selected New Zealand as a base, and mighty glad we

are back. Our Polar flight was not more outstanding than the discovery of new land, comprising 280,000 miles, which we named Marie Byrd land.

New Heinkel Factory

OWING to the increased amount of work, the Ernst Heinkel Flugzeugwerke G.m.b.H., Warnemünde, Germany, has purchased an additional factory with a floor space of about 60,000 sq. ft. This new factory is in Rostock, a city some 10 miles from Warnemünde. The new plant has both railway connections to the main railway lines and waterway connection by the Warnow River, which flows into the Baltic at Warnemünde. This new factory will be used chiefly for production while design and construction of new experimental types will be continued at the Warnemünde factory situated on the airport there. The main offices of the factory will remain in Warnemünde.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

AIR ACCIDENTS

[2285] For the interest of G. D. Everington, Esq., and others, I make the following statement:—

A more practical method of fire control than dropping high explosive petrol bombs from the air was designed by me. After being approved of by H. P. Folland, Esq., Chief Engineer of the Gloster Aircraft Company, was presented to the British Air Ministry in October, 1929.

ERNEST FRED FURBY.

Acton, London.
March 7, 1930.

FLYING SCALE MODELS

[2286] In answer to Mr. D. de Guerin's letter regarding the Hawker Hornet Model, published in the February 28 issue of FLIGHT. The diameter and pitch of the airscrew on the model are 13 in. and 19 in. respectively. As I have no particulars of the airscrew used on the full-size Hornet, a comparison is not possible. The length between the hooks is 26 in. and the length of the elastic unstretched is 34 in. The motor is normally wound to 550—600 turns. The total weight of the model in flying trim is 23½ ozs., and the wing loading, 8.6 oz. per sq. ft. The true scale wing section was not used, as from my experience it is necessary to use a thicker section than the true scale. Here, again, I had no data concerning

the section used on the full-sized Hornet. I am afraid that Mr. D. de Guerin will find it extremely difficult to keep the weight of his model down to 10 oz., if it is to have structural strength.

D. M. EDWARDES.

Send, Surrey.

March 3, 1930.

CHEAPER FLYING

[2287] I was pleased to see the attention of your readers drawn to the Comper "Swift" monoplane. I certainly regard this machine as the leader of a class of light 'plane that has never yet been appreciated. With a petrol consumption of little more than a motor cycle, this craft enables one to travel with car comfort at express speed.

The "Swift" seems to incorporate all that can be desired by the private owner and although a beautiful machine on the ground the "Swift" must be seen in the air to be fully appreciated.

I would mention that I am not in any way connected with the Comper Aeroplane Company.

W. A. WILLCOX,
Liverpool Aero Club.

Rock Ferry, Cheshire.

March 2, 1930.

PERSONALS

Married

FLYING OFFICER ALFRED JOHN HOWELL, R.A.F., Kenley, Surrey, son of Mr. and Mrs. C. E. Howell, of Pedmore, Worcestershire, was married on February 11, at the Church of Our Lady and All Saints, Stourbridge, to MARY AGNES TRINHAM, daughter of Colonel and Mrs. Trinham, of Oldswinford, Worcestershire.

Flight-Lieut. C. S. STANILAND, second son of Mrs. Staniland, of Abbey House, Louth, was married quietly, on February 19, at St. Peter's-in-Eastgate, Lincoln, to Miss EVELYN MARY GREGORIE, daughter of Mr. and Mrs. F. St. B. Gregorie, of Stones Place, Skellingthorpe, Lincoln.

The marriage took place, on February 27, at St. Mary's, Uffculme, Devon, of Sqdn.-Ldr. THEODORE QUINTUS STUDD, son of Mr. and Mrs. E. F. Studd, of Exleigh, Starcross, Devon, and Miss ESTHER MARY NEW, elder daughter of Mr. and Mrs. H. H. G. New, of Craddock, Culmpton.

CLAUDE BERNARD RAYMOND PELL, R.A.F., eldest son of Rev. and Mrs. D. R. Pelly, of Woolbeding, Sussex, was married on February 15, at All Saints, Hove, to MARGARET OGILVIE, only daughter of Mr. E. J. SPENCER, of Grand Avenue, Hove, and the late Mrs. Spencer.

To be Married

The marriage arranged between Flight-Lieut. G. P. H. CARTER and Miss ESTHER MACANDREW, of Aisthorpe, Inverness, will take place on March 20 at the Garrison Church, Moascar, Ismailia, Egypt.

THE marriage arranged between Flying Officer THOMAS GEOFFREY PIKE, R.A.F., youngest son of the late Capt. S. R. Pike, R.A., and Mrs. Pike, of Tonbridge, and Miss KATHLEEN ALTHEA ELWELL, of Harlow, Essex, will take place on Wednesday, April 23, at St. Mary Magdalen's Church, Harlow Common, Essex.

The engagement is announced between Mr. HUGH M. G. PARKER, R.A.F., second son of Lt.-Col. G. M. G. Parker, late Indian Army, and Mrs. Parker, and KITTY, only daughter of Mrs. H. GILCHRIST LANGLEY, of 46, Waterloo Road, Bedford.

MODEL CLUBS

Society of Model Aeronautical Engineers (S.M.A.E.)

GAMAGE CUP.—To be held at Wimbledon Common, on Saturday, March 29, 1930.

1. The competition to be an open one. Entrance fee for non-members, 1s.
2. Any type of model aeroplane may compete.
3. The best duration of three flights to count.
4. Any model which rises from the ground under its own power for any of its three flights will be given an additional ten points for that flight to be counted as seconds.
5. Competitors using compressed air models will only be allowed to charge their containers with pumps operated by physical energy.

Prizes.—1st, Winner to hold Cup for one year and Silver Medal.
2nd, Bronze Medal.
3rd, Diploma.

World's Records

THE Royal Aero Club has been notified by the F.A.I. of the granting of the following World's Records:—

Light Aeroplanes (Single-seater) France.—Aircraft: Albert monoplane. Motor: Armstrong-Genet. Pilot: M. Albert. Place: Le Bourget. Date: February 11, 1930. Performance: Altitude 7,730 metres.

Light Aeroplanes (Two-seater) Italy.—Aircraft: Fiat A.S.1. Motor: Fiat A.50. Pilot: Renato Donati. Place: Montecelio-Rome. Date: February 20, 1930. Performance: Altitude 6,782 metres.

The engagement is announced between NICHOLAS ANTHONY PEARCE, R.A.F., younger son of the late Robert Pearce and Mrs. Pearce, of Ripley Court, Surrey and KATHERINE ANN, only daughter of the late JAMES TORQUIL MACNUS MACLEOD, of Aros Rhu, Dumbartonshire, and Mrs. MACLEOD of Vale House, Iwerne Minster, Blandford. The marriage will take place early in March.

The engagement is announced between Wing-Commander H. R. RAIKES, R.A.F.C., late R.A.F., Principal of the University of the Witwatersrand, Johannesburg, third son of the late Canon W. A. Raikes, of Goudhurst, Kent, and Mrs. Raikes, and JOAN, only daughter of the late CHARLES MYLNE MULLALLY, I.C.S., and Mrs. Mullally, of Oxford.

The engagement is announced between Sqdn.-Ldr. W. H. DE W. WALLER, R.A.F., second son of the late Mr. and Mrs. Albert Waller, of Shannon Grove, Banagher, King's County, and ELISABETH HOPE, daughter of the late Mr. H. E. LAMBE and of Mrs. LAMBE, Grove House, Semley, Shaftesbury, and step-daughter of Air Vice-Marshal C. L. Lambe.

Items

Pilot Officer LAURENCE ERRINGTON JEFF LUCAS, R.A.F., of the Royal Air Force Station, Upavon, Wilts, and of Kevor, Falmouth, who was killed at Upavon in a flying accident, on September 10, 1929, left unsettled property of the gross value of £5,686. He died intestate and a bachelor.

Sqdn.-Ldr. ARTHUR GORDON JONES-WILLIAMS, M.C., of Pembroke Avenue, Hove, who was killed at Djibbel Lit, Zaghouan, Tunis, Africa, in an accident while on a non-stop flight from England to South Africa, on December 17, aged 31, left estate valued at £202. He died intestate and a bachelor.

The will of the late Wing-Commander and Lieutenant-Colonel JOHN DUNVILLE-DUNVILLE, C.B.E., R.A.F., of Redburn, Hollywood, Co. Down, and of Portland Place, London, W., the balloonist and aeronaut, chairman of Dunville's Distillery, Ltd., has been proved at £33,812.

Harrogate Aircraft Club (Model Section)

THE Model Section of the Aircraft Club will hold an Open Competition, on April 5, 1930. The chief prize will be for duration of flight. Classes will be arranged in accordance with the entries received. Entrants should state:—

Type of Model, i.e., Single prop, two-prop, monoplane, biplane, tractor, pusher, etc.

Type of Power, i.e., Elastic, petrol, compressed air, etc.

Type of Launching, i.e., Hand, catapult, rise from ground, etc.

No prize will be offered for a class unless there are more than three starters. The class in which a model is placed shall be decided by the Judges.

All entries should be in by March 27. Mr. R. W. Johnson, who has retired from the R.A.F., after 15 years' service with the R.A.F. and R.N.A.S., is in charge of the Model Section, and all entries and correspondence in connection with the competition should be addressed direct to him in future at Astra House, West End Avenue, Harrogate.

The I.L.A. Trophy

THE International League of Aviators has awarded the international trophy for 1929 to the French airman, Capt. Costes, the trophy for women aviators to Miss Winifred Spooner (Great Britain), and the national trophy to Capt. Barnard (Great Britain).

No. 28 Squadron (R.A.F.) Old Boys' Association

THE above Association will be holding a Social on April 5 at Slater's Restaurant, 34-35, High Holborn (adjoining Chancery Lane Tube Station). Tickets 3s. single, 5s. double. Assembling 6.30 p.m. sharp.

CANADA'S WAR IN THE AIR

QUIETLY and undramatically Canada is waging a constant campaign in the air against fire that ever menaces her vast timber resources. Constituting as they do so important a part in the economic life of the country, every effort is made by the Federal and Provincial Governments to provide Canada's forests with adequate protection against fire; and remarkable strides have been taken and remarkable results have been achieved in this direction.

Outstanding among the various and ingenious methods resorted to by the authorities charged with the preservation and protection of the forests against fire has been the use made of aircraft. According to E. H. Finlayson, director of forestry in the Department of the Interior at Ottawa, Canada was one of the first, if not the first, to introduce planes in forest protection, and today the Dominion, among the many uses made of aircraft peculiar to that part of the world, finds them invaluable in this service.

Machines in service are roughly of two classes, "detection," planes, and "suppression" planes. The detection plane is usually an Avro or Moth mounted on floats or a small flying-boat of the Vedette type. These detection planes are equipped with a light wireless sending set which uses either telephone or telegraphic signals and enables the pilot to keep in touch with his base while on patrol. The suppression plane, as its name implies, is used in carrying fire-fighting crews and equipment to the scene of the fire. It is usually a large twin-engine flying boat, capable of carrying large load, and is of the Viking or Varuna type.

The development of protective air services has been made within a comparatively short period. In 1923 matters were still in the experimental stage. Obsolete war-time equipment was being used, costs were high, and results not too satisfactory. Today there are specially designed aircraft for this work as given above, and costs have been materially reduced, and efficiency greatly increased. Last year the entire basis of fire protection of the Northern forest area in Manitoba and Saskatchewan, over 60,000,000 acres, was in air operation, and an even larger area is protected in the province of Ontario, where the provincial government owns and operates its own air service.

Experience has shown, however, that the exclusive use of aircraft for detection purposes alone is uneconomic, that the results received do not justify the expenditures involved.

In the Province of Alberta aircraft have been operated for some years in fire-protection work on the east slopes of the Rockies. Land machines had, of necessity, to be used, and lack of landing facilities restricted activities to the function of detection. When these operations were inaugurated the forest service of the department of the interior was faced with the problem of making a large capital expenditure in the

installation of lookout stations in this region, and before doing so it was decided to experiment with aircraft. Detection patrols have been carried on each season since 1921, and undoubtedly a very commendable success has been achieved, not only in actually reporting fires, but also in the psychological effect produced among forest users and travellers. Nevertheless the cost, especially overhead, has been high, and the authorities have now come to the conclusion that the detection can be obtained more economically through the use of stationary lookouts with telephone connections to forest headquarters. Lookout facilities are now being installed

and in the future aircraft will probably be used merely as a supplement to the lookout system during periods of high fire hazards, when weather conditions are abnormally bad, and for scouting purposes, transportation of fire-foremen, etc., in connection with fire fighting operations.

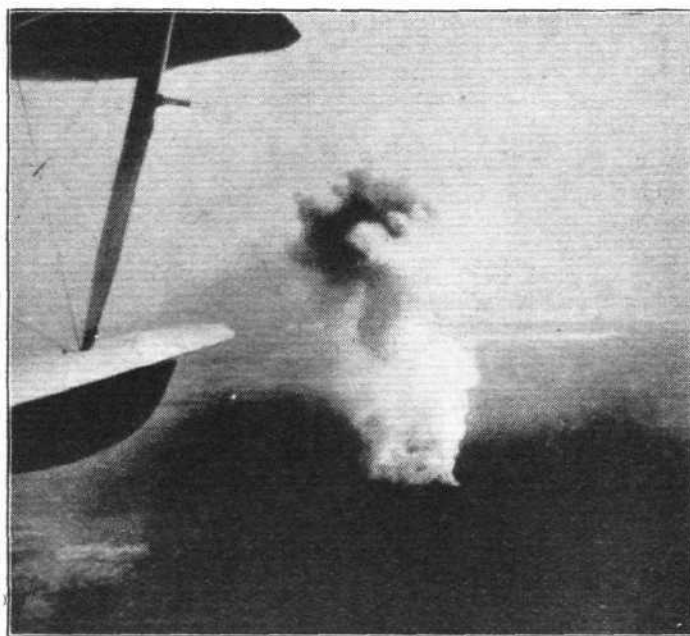
Where, however, air-operational costs can be spread over suppression activities also, as is the case in the northern forest regions, the operations become financially feasible. Furthermore, these northern areas present almost insuperable difficulties of protection by any other means. Communication is lacking; all transportation must be by waterways, involving the use of canoes and frequent portaging; few settlements exist, and, consequently no labour supply is available. Therefore, any method of protection other than by use of aircraft is quite defective and is, in fact, reduced

largely to the moral effect of patrols on travellers who encounter them during their journeys.

These northern forests, consisting largely of spruce, are the foundation of Canada's pulp and paper industry. Their importance and value increases yearly, and their future destruction by fire would be little else than a calamity to the Dominion.

The advent of aircraft has provided an important instrument for effective protection at costs justified by values involved. That these costs are low is due in large part to the presence of numberless lakes throughout the forest regions, in fact, about one-third of the total superficial area is taken up by lakes and rivers which provide natural landing grounds for hydro aircraft, not only ensuring safety of operations but also enabling approach within a very short distance of any fire starting.

So general is the appreciation among people in Canada of the value of their forests that many organisations contribute to their protection in various ways, and not the least interesting is the practice of the Canadian Pacific Railway in patrolling its right of way in forested areas with the express purpose of watching for outbreaks of fire. Men are specially detailed for this service, tank cars, steam pumps, and supplies of hose are held in readiness at strategical points and prompt measures taken to combat fires within reach.



A Forest Fire in the Rouyn District, Province of Quebec, photographed from one of the fire-fighting aircraft.

D.H. "MOTH SIX"

(Concluded from page 293)

With the Wright R.975 engine the gross weight of the landplane is increased to 3,800 lb., which increases pilot and payload weight to 794 lb. for 560 miles range, and to 1,063 lb., with 280 miles range. The estimated performance with the Wright engine is as follows:—

	Landplane	Seaplane
	3,800 lb.	3,800 lb.
Max. speed at ground level ..	131 m.p.h.	128 m.p.h.
Cruising speed at 1,000 ft. ..	109 "	105 "

	Landplane	Seaplane
	3,800 lb.	3,800 lb.
Max. speed at 5,000 ft. ..	124 m.p.h.	121 m.p.h.
Max. speed at 10,000 ft. ..	115 "	112 "
Stalling speed ..	55 "	54 "
Rate of climb at ground level ..	790 ft./min.	760 ft./min.
Time to climb 5,000 ft. ..	7.5 min.	8.5 min.
Time to climb 10,000 ft. ..	17.5 "	21.5 "
Absolute ceiling ..	17,500 ft.	15,500 ft.
Service ceiling ..	15,000 "	13,500 "

AIR MINISTRY NOTICES

NOTICES TO AIRMEN

Examination for Air Navigators

1. An examination for 2nd Class Air Navigators' Licences will be held at the Air Ministry, Gwydyr House, Whitehall, and concurrently at the office of the Air Ministry Representative, Heliopolis Aerodrome, Cairo, on Monday, Tuesday and Wednesday, March 24, 25 and 26, 1930.

2. Application forms, the syllabus, and conditions of examination may be obtained on application to the Secretary, Air Ministry (C.A. 2), Gwydyr House, Whitehall, London, S.W.1, or to the Air Ministry Representative, Cairo-Karachi Service, Heliopolis Aerodrome, Cairo, Egypt.

3. Formal applications to sit at this examination must be made on Form C.A. 2c, and, together with the prescribed fees, must be received at one of the above addresses not later than Monday, March 10, 1930.

(N.B.—Applications to sit in London should be sent to the Air Ministry, and applications to sit in Heliopolis should be sent to Cairo.)

4. Before a licence can be issued, candidates will have to pass the prescribed medical examination. In the case of candidates sitting in London arrangements can be made for their special medical examination at the Central Medical Board to take place on Wednesday afternoon, March 26, 1930, if early application is made to be examined on that day. Otherwise special arrangements will be made.

5. All prospective candidates should note that the prescribed fee for the Technical examination will be 2 guineas, and that the additional subject "Visual Signalling" will be included in the forthcoming examination.

General Notice. (No. 6 of 1930.)

Italy: Violation of Prohibited Areas; Low Flying over Towns

1. REPRESENTATIONS have been made by the Italian Government that certain British civil pilots, when flying in Italy, have failed to observe the Italian regulations concerning prohibited areas, and altitude of flight over inhabited areas.

2. Details of the areas in Italy over which flying is prohibited were published in the Monthly Supplements No. 52, 54 and 55 to *The Air Pilot* (1924 Edition). Particulars of the areas can also be obtained from the under-mentioned sources:—Automobile Association, Panum House, New Coventry Street, W.1.; National Flying Services, Ltd., Grand Buildings, Trafalgar Square, W.C.2.; Royal Aero Club of the United Kingdom, 3, Clifford Street, W.1.

3. The Italian regulations concerning altitude of flight over inhabited areas are as follow:—

Flight over any inhabited area or any gathering of people, at such a low altitude as would make it impossible to alight outside the area or gathering in gliding flight, is prohibited.

General Notice. (No. 7 of 1930.)

Flying of Captive Balloon at Chelsea, London

It is hereby notified:—

It is intended to fly a captive spherical balloon for advertising purposes from a position in Chelsea, London. Details are as follow:—

Position.—Lat. 51° 29' N. Long. 0° 11' W. In Lots Road, Chelsea, London, approximately 3½ miles S.W. by W. of Charing Cross.

Altitude of Flight.—The balloon will be flown at an altitude not exceeding (300 ft. 91 m.) above the ground.

Programme of Flying.—Between 0900 and 1830 hours, on any day from March 1, 1930, to October 31, 1930, inclusive.

Markings.—The balloon will normally support an advertising device, but the mooring-cable will not be marked.

Navigational Warning. (No. 4 of 1930.)

Flight in the Vicinity of Cardington Mooring Tower

1. NOTICE to Airmen No. 62 of the year 1929 (N/A. Navigational Warning No. 1/1930, Reprint No. 4), restricting the flight of aircraft in the vicinity of Cardington Mooring Tower, is hereby cancelled.

2. Attention is, however, drawn to the fact that Bedford (Cardington) Airship Station is available for use by civil aeroplanes only in cases of emergency.

Navigational Warning. (No. 5 of 1930.)

NOTICES TO AIRCRAFT OWNERS AND GROUND ENGINEERS Maintenance of Aircraft and Engine Log Books

1. The Air Navigation Directions, A.N.D. 7, paragraph 57, as amended by A.N.D. 7b, require the certification in the prescribed form, by qualified persons, of all overhauls, repairs, modifications or replacements in connection with any aircraft in respect of which a Certificate of Airworthiness has been issued. These certifications are to be made in the aeroplane or engine log book as the case may require.

2. It is essential that full details of any such work should be entered in the log book, and that the entries should be correlated clearly. A line should be ruled across both pages of the log book under any certificate in such fashion as will indicate that repairs, for instance, were done following a particular flight. Subsequent flights should be recorded under this line.

3. Certifications in log books must be worded in the form given in A.N.D. 7, paragraph 57. The signatory must always state not only his name, but also his designation, e.g., in the case of a ground engineer his licence number and category, and in the case of a representative of an approved inspection organisation, the name of the firm on whose behalf he is acting, and the reference number of the Air Ministry Authority.

4. The correct maintenance of a log book record of the life of a machine is of service to the owner, when the aircraft comes up for renewal of its Certificate of Airworthiness. If full particulars are given of all replacements or repairs and all abnormal occurrences, and if the necessary certificates are properly entered, the inspection for purposes of renewal is greatly facilitated. If, on the other hand, it is found that work has been done for which no certification exists, it may become necessary to withhold the renewal of the Certificate of Airworthiness. (No. 4 of 1930.)

Effects of Timber Shrinkage on Aircraft

1. The attention of all Aircraft Owners and Ground Engineers is directed to the importance of maintaining as tight as possible without damage or distortion of the wood, all bolts which, in passing through wooden members, are connected by metal plates embedded in or on the face of the timber, as, in the case of fittings of this type, timber shrinkage may cause slackening of the bolt. Frequent examination is therefore essential, and, in the case of important fittings such as main spar joints, this examination must be made at least twice a year.

2. In cases such as the above, timber shrinkage may also cause cracks in the neighbourhood of the bolt holes. If the bolts are situated within a short distance of the extremity of the wooden member and the cracks are small and occur only between the bolts and the end, their presence need not normally be considered serious. If, however, the cracks pass through the bolt holes into the main body of the member, there is danger of the strength of the member being seriously reduced, and its reinforcement or replacement in an approved manner becomes essential.

3. The ends of spars must, therefore, be frequently examined, and when cracking is discovered, the wing must be opened up and the spar examined to see how far the cracks extend.

4. Cancellation.—Notice to Ground Engineers No. 25 of 1929 is hereby cancelled. (No. 5 of 1930.)

THE ROYAL AIR FORCE MEMORIAL FUND

THE Executive Committee met for the first time during the current year at the offices of the Fund, No. 7, Iddesleigh House, Caxton Street, London, S.W.1, on Wednesday, 5th inst. There was a very large attendance of members, Sir Charles McLeod, Chairman and Honorary Treasurer in the Chair, and the following members attended:—Dame Helen Gwynne-Vaughan (*Deputy Chairman*), Lady Leighton, Mrs. B. H. Barrington-Kennett, Mrs. L. M. K. Pratt-Barlow, Air Marshal Sir E. L. Ellington, Air Vice-Marshal C. A. H. Longcroft, Air Vice-Marshal C. L. Lambe, Air Vice-Marshal T. I. Webb-Bowen, Air Vice-Marshal A. E. Borton, Air Vice-Marshal A. M. Longmore, Mr. F. E. Rosher, Lieut.-Comdr. H. E. Perrin, Mr. W. S. Field.

After the usual financial statement had been made, the annual report and audited statement of accounts, both as regards the General Fund and the Vanbrugh Castle School Account were submitted to the members for their approval, each member having had the report sent to them by way of proof copy a fortnight before the meeting.

The Executive Committee approved of the accounts and authorised the Honorary Treasurer and the Secretary to sign the accounts and to issue the annual report to all concerned in due course.

The state of the Struben Trust Account (administered by the Fund) was reported to the meeting. This Fund concerns help to the relatives of any officer of No. 25 Squadron, R.A.F., who may be killed, or dies whilst on duty, and was instituted by Major Struben in memory of his late son, Flying Officer H. M. Struben, No. 25 Squadron. So far no claim has been made on this Trust Fund.

The resignation from the Executive Committee of Air Vice-Marshal Sir Sefton Branner, K.C.B., was accepted by the Committee with great regret, the Vice-Marshal finding his many duties preventing him attending regularly the meetings of the Committee.

The following new members of the Committee were welcomed by the Chairman during the meeting:—Air Vice-Marshal C. L. Lambe, C.B.; Air Vice-Marshal T. I. Webb-Bowen, C.B.; Air Vice-Marshal A. M. Longmore, C.B.

The Grants Sub-Committee between the dates December 11, 1929, and March 5, 1930, at their various meetings, dealt with 63 cases of appeals for help, and in the same period the Secretary dealt with 196 cases.

The Committee had before them a proposal to change the title of the Fund, various proposals being made, but ultimately, by vote, it was decided that no change should be made in the present title, but that when the Committee issue any posters or publications setting forth the activities of the Fund, certain words were to be inserted under the title explaining a little more fully the obligations of the Fund, the words being as follows:—" (for the help of all ranks in memory of those who died serving)." Various grants made by the Grants Sub-Committee out of the Salting Benefaction Fund and Anonymous Education Fund (both of which are administered by the R.A.F. Memorial Fund) were approved by the Executive Committee.

The next meeting of the Executive Committee was fixed for April 30.

The usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House, on January 23. Lieut.-Comdr. H. E. Perrin was in the chair, and the other member of the Committee present was:—Mrs. L. M. K. Pratt-Barlow, O.B.E. The Committee considered in all 12 cases, and made grants to the amount of £200 19s.

At the meeting held on February 6, Mr. W. S. Field was in the chair, and the other member of the Committee present was:—Mrs. L. M. K. Pratt-Barlow, O.B.E. The Committee considered in all 10 cases, and made grants to the amount of £458 3s. 11d.

At the meeting held on February 20, Mr. W. S. Field was in the chair, and the other members of the Committee present were:—Mrs. L. M. K. Pratt-Barlow, O.B.E.; Lieut.-Comdr. H. E. Perrin; Squadron-Leader A. H. Wann.

The Committee considered in all 13 cases, and made grants to the amount of £813 12s. 6d.

IN PARLIAMENT

Royal Air Force Display

MR. MONTAGUE, on March 3, in reply to Mr. Day, said the R.A.F. Display programme has now been decided except for details, and follows the general lines of those of previous years. Certain new events are, however, being introduced, which are designed to demonstrate the improvement in equipment and training achieved by the Royal Air Force. New and experimental types of aircraft will also be demonstrated. The set piece, which terminates the display, deals with air action taken to bring the activities of certain pirates to an end.

London Terminal Aerodrome

MR. MONTAGUE, on March 5, in reply to Mr. Wardlaw-Milne, said the question of the provision of a more central aerodrome for London than Croydon was fully considered by the Civil Aviation Advisory Board, who presented their Report in January, 1923 (Cmd. 1816), and, on their recommendation Croydon aerodrome was retained as the London terminal aerodrome, and was enlarged and improved.

Mr. Wardlaw-Milne asked if he thought, or his department thought, that conditions had changed so much since 1923 that the matter really required further consideration by an expert committee?

Mr. Montague: I can assure you that the Department has the matter under very serious consideration indeed.

Municipal Aerodromes

MR. WEST RUSSELL asked the Under-Secretary of State for Air whether he is satisfied with the progress being made in the provision of municipal airports; and whether he proposes to take any steps to give local authorities more practical encouragement to provide them at the earliest possible date?

Mr. Montague: I am satisfied that municipalities as a whole are keenly alive to the importance of providing aerodromes and the progress which is being made with their actual provision is, I think, encouraging. It is regretted that it is not possible to give financial assistance from public funds, but the Air Ministry is always ready to give expert advice and all other help possible to local authorities who are considering schemes for aerodromes.

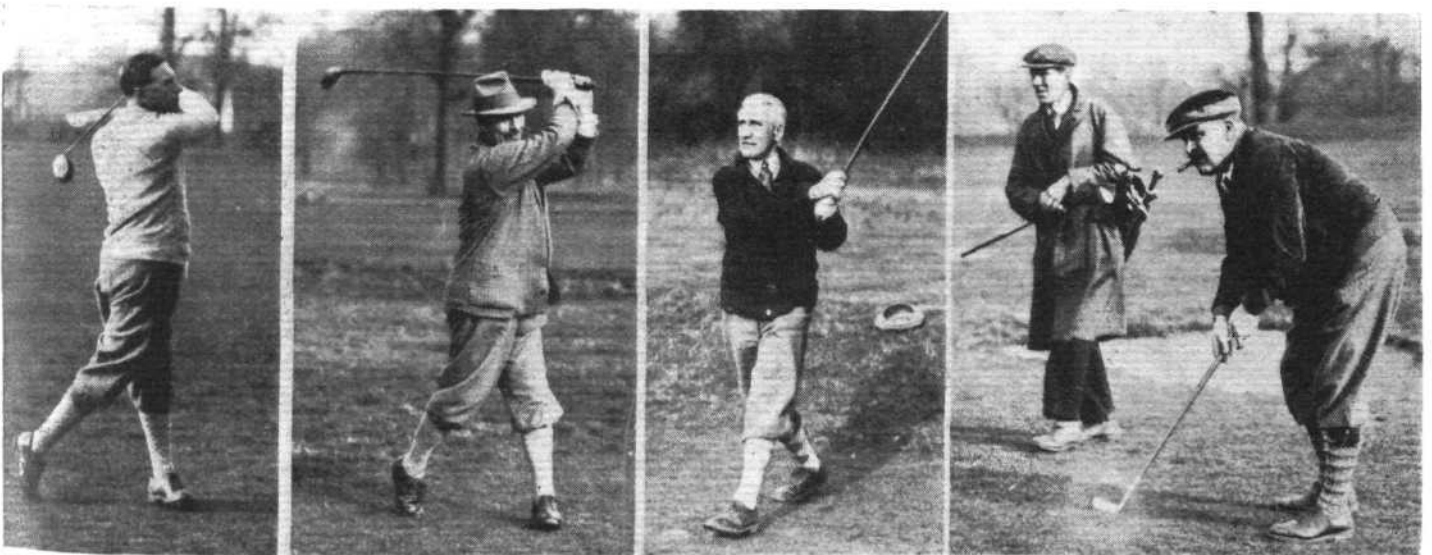
AERO v. MUSIC



On March 4 the Aero Golfing Society played the Music Industries Golf Society at Richmond, the former winning. Our group shows the players. (FLIGHT Photo.)



Some Aero Golfers : Left to right, Mr. C. R. Fairey, Mr. F. Handley Page, Captain C. D. Barnard, Mr. Wallace Barr, and Mr. H. E. Perrin. (FLIGHT Photos.)



Some Music Golfers : Left to right, Mr. A. G. Brasted, Mr. J. A. Beare, Mr. P. J. Langley, and Mr. Steinway. (FLIGHT Photos.)

AIR CO-OPERATION WITH MECHANIZED FORCES*

ON Wednesday, March 5, Wing Commander Leigh-Mallory, D.S.O., delivered a lecture on "Air Co-operation with Mechanized Forces," before the Royal United Service Institution. Lieut.-Gen. Sir A. A. Montgomery-Massingberd, K.C.B., was in the chair. The lecturer started by saying that he would confine his remarks to the case of an armoured force, as mechanized forces made too wide a field. He then referred to the battle of Cambrai in 1917 when tanks were first used with proper effect. The G.O.C. Tanks asked for air-co-operation, so No. 8 Squadron was told off for this duty. Its work was purely reconnaissance. It was found in this battle that many tanks fell victims to anti-tank guns, so, in the battle of August 21, the tanks asked for fighters to attack the anti-tank guns. No. 73 Squadron was allotted for this duty, and by locating the guns and attacking them in the rear with machine-gun fire, the squadron very materially helped the tanks. The fighters suffered fewer casualties than did the army co-operation machines. The lecturer then passed on to the case of the armoured force of 1927-28, and mentioned the lessons learnt from its experiences. He said that the G.O.C. Tanks would want detailed reconnaissance and photographs of the country over which he would have to attack. This might imply reconnoitring to a depth of about 40 miles, and perhaps flying in formation. On the day of the tank attack, the army co-operation machines would report by radio telephony. The G.O.C. Tanks would also like the help of fighters to attack the anti-tank guns, but this would not be easy to arrange. The aerodrome might be 50 miles away, and the fighters would have to come up at the very last moment. It would take them some time to grasp the position and to locate the guns, and perhaps by the time they were able to take effective action, the tank battle might be over. It would be quite essential that the fighters must have very full information before they started, and this would not be easy to provide. He could not really recommend this use of fighters. Moreover, when the tanks were not attacking a prepared position, the defence would not be so strong, and he thought that the tanks should be able to look after themselves. Probably, in the early stages of a battle, the fighters would be needed for the air battle, and would not be available for army work.

The lecturer thought that the future of tanks would be elastic. They could work either as a homogeneous force or as part of a heterogeneous force. In either case, aircraft would be able to help them. He thought it essential that the G.O.C. Tanks should only have to deal with one R.A.F. officer, say a Wing Commander, but it was a question whether that officer should stay with H.Q. or with his squadrons. His own suggestion was that if the country was bad for flying over, the Wing Commander should go forward with H.Q. and send orders back to the squadrons; but that when the country had plenty of suitable landing grounds he should stay back with the squadrons.

Turning to the future, Wing Commander Leigh-Mallory said that aircraft would not be able to spot anti-tank machine guns. Another new weapon was the "close support tank," whose chief duty would be to discharge smoke. This would be a guide to the aircraft. Then the use of a screen of light tanks would probably force the enemy to unmask some of his anti-tank guns before the medium tanks were fully engaged, and fighter aircraft could deal with those guns. Though the fighters would not be available in the early stages of a battle, when the position became stabilized they might be able to help in prepared battles.

The essence of a tank attack was surprise, and the R.A.F.

must try to preserve the secrecy of the preparations. But it could not ensure complete secrecy. Even in 1918, when our machines had a 2 to 1 superiority, the Germans did quite a lot of reconnoitring from the air. If all ground movements were made by night, it was a fact that aircraft, by using night flares could discover movements on a road and even recognise the types of vehicles on the move. The odds on a night movement getting through unperceived were about 7 to 3. Once a body of tanks had got under cover for the day, there was a very good chance that they might escape observation from the air.

They were all agreed that tanks would not be likely to fight in Great Britain. Fighting overseas meant transporting petrol, and this was a store easy to spot from the air and easy to destroy. Likewise, a concentrated armoured force, once spotted, would be very vulnerable to air attack. Such a force would not want to concentrate except just before the attack; but some considerations, such as sparsity of cover, and the desire to avoid sending messengers all over the country, might force it to concentrate. On the other hand, tanks might hamper air action by raiding the aerodromes, and forcing them back, which would reduce the number of flights per diem. When tanks wanted to catch an enemy on the march, and there was only one favourable spot for a tank attack (for tanks were no use in wooded country), the aircraft could prevent the enemy passing that spot while the tanks were coming up. In the same way, aircraft could check a retreating enemy until the tanks caught him.

A few questions were then asked, and except for one, they showed how little knowledge some officers of the army and navy have of the powers and limitations of aircraft. First an army officer asked (and it seemed a very sensible query) why, if no fighters were available, the army co-operation machines themselves could not attack the anti-tank guns. The lecturer replied that if it were difficult to bring up fighters at the last moment, it would be equally difficult to bring up more army co-operation machines. Also the army co-operation type was not suitable for diving on to guns. No. 8 Squadron had had heavy casualties in 1918. Next a naval officer asked whether the presence of the aircraft would not give away the surprise, and whether a premature attack from the air would not frighten a timid enemy and so prevent a decisive action. The answers given were that the air was a large place, and a few aircraft might be up without arousing the enemy's suspicions. As for frightening him, that might be possible on the sea, when speeds were about equal, but a column on a road could not turn straight away and escape from tanks following hard after the aircraft.

The chairman asked whether aircraft could protect a column on the march, as anti-aircraft guns could not do so. The lecturer replied that that would depend on the amount of air superiority which had been won. If it were considerable, the aircraft would attack enemy aerodromes and try to keep enemy aircraft aground. Otherwise, they might concentrate their aircraft and aim at temporary local superiority. Another colonel said that tanks should not aim at gaining ground but at destroying personnel, and he would advocate concentrating the tanks outside artillery range. The lecturer replied that though that might seem far away to a gunner, it would be very close up to the Royal Air Force. The usual votes of thanks were then carried.

* Lecture by Wing Commander T. L. Leigh-Mallory, D.S.O.

S. Smith & Sons' Annual Staff Dinner

S. SMITH & SONS (M. A.), LTD., whose name is a household word throughout the world for both motor-car and aircraft instruments, held their annual staff dinner and dance on Saturday last at the Russell Hotel, and an extremely delightful and cheery evening it was. All the associated companies were well represented also. In the absence of the chairman of the company (Mr. Henderson Acland) through illness, Mr. Gordon Smith, with his usual happy manner and smile, presided, supported by the ever-popular Mr. Nicholls. A glowing tribute was paid to the staff in the chairman's speech to the effect that Smiths' Instruments had attained the position they enjoy mainly through the happy and conscientious co-operation of all.

Mr. Chorlton, whose "baby" is the Aircraft Instrument side of the business, was responsible for the arrangements

and produced, as usual, a very unique programme which caused considerable merriment.

The Journal of the R.A.F. College, Cranwell. Vol. X. No. 1

THE *Cranwell Journal* Spring Number maintains its usual very high standard. Reading matter and illustrations are alike excellent. Among notable features are a reprint of Kipling's "Hymn of the Triumphant Airman," Flight-Lieut. Waghorn's own account of his experiences in the Schneider Race, and "My Life at Cranwell and My First Flying," by Flight-Cadet Majdid-din Naqib, who found that "the drill was awful because of the language," but who now feels a great improvement in his language. The doings of the College are, of course, faithfully recorded, and it is good to learn that this excellent College is going on as well as ever it has done.

THE ROYAL AIR FORCE

London Gazette, February 25, 1930.

General Duties Branch

Pilot Officer on probation A. T. Wilson is confirmed in rank (February 2). The follg. Pilot Officers are promoted to rank of Flying Officer:—J. Addison (October 30, 1929); J. K. Flower (January 14); E. M. F. Grundy, A. L. Weait, N. E. White, C. V. J. Pratt (January 28); J. A. H. Loudon (January 30); S. S. Mackay (February 24).

Flying Officer V. H. Nicolay takes rank and precedence as if his appointment as Flying Officer bore date January 9; Group Capt. E. F. Briggs, D.S.O., O.B.E., is placed on retired list at his own request (February 13); Flying Officer N. S. Little is transferred to Reserve, Class C (February 26); Flying Officer (Hon. Flight-Lieut.) L. P. Winters relinquishes his short service commn. on account of ill-health (February 13); the short service commn. of Pilot Officer on probation W. S. Moody is terminated on cessation of duty (February 20).

Accountant Branch

The follg. Flight-Lieuts. are placed on retired list at their own request:—F. R. Barton (February 15); R. F. C. Metcalfe (February 26).

ROYAL AIR FORCE INTELLIGENCE

Stores Branch

Flight Lieutenants:—H. E. T. Crocker, to H.Q., Iraq Command, 18.1.30. T. S. James, to Aircraft Depot, Iraq, 18.1.30.

Flying Officers: R. H. Clay, to No. 2 Flying Training Sch., Digby, 1.3.30. J. W. Hunt, to R.A.F. Depot, Uxbridge, 1.3.30.

Pilot Officer H. H. Hilliar, to School of Naval Co-operation, Lee-on-Solent, 13.2.30.

Accountant Branch

Squadron Leader C. C. J. Croydon, to No. 205 Sqdn., Singapore, 21.2.30. Flight Lieutenant R. F. C. Metcalfe, to R.A.F. Depot, Uxbridge, 11.2.30.

Medical Branch

Flight Lieutenant R. H. Stanbridge, to R.A.F. Depot, Uxbridge, 14.2.30. Flight Lieutenants: J. B. Gregor, to Station H.Q., Upper Heyford, 5.3.30. C. G. J. Nicolls, to Princess Mary's Hospital, Halton; 23.3.30. P. H. Perkins, to Station H.Q., Andover; 25.2.30.

Medical Branch

J. Murphy, M.B., B.Ch., is granted a temp. commn. as Flying Officer with effect from and with seniority of February 3; Flight-Lieut. J. P. Hederman, L.R.C.P. and S., is transferred to Reserve, Class Dii (February 23); Flight-Lieut. J. McM. Wilder, M.R.C.S., L.R.C.P., relinquishes his permanent commn. on transfer to Indian Medical Service (February 22).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Pilot Officers are promoted to rank of Flying Officer:—M. G. B. Clark (February 11); M. F. Ogilvie-Forbes (February 20); J. T. S. Horsfall (February 22); E. J. Brighton (February 24).

Stores Branch

Flying Officer R. Lamb is transferred from Class B to Class C (September 30, 1929).

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—The follg. Pilot Officer to be Flying Officer (December 25, 1929):—W. E. Windham.

Flying Officers: O. G. Harold, to R.A.F. General Hospital, Iraq, 19.1.30. A. Sheehan, to R.A.F. General Hospital, Iraq, 19.1.30. G. O. Williams, to No. 100 Sqdn., Bicester, 20.2.30.

Flying Officers: A. P. Atkins (Dental), to Home Aircraft Depot, Henlow; 21.2.30. C. M. Leckie (Dental), to H.Q., Iraq Command; 11.2.30.

Flying Officers: J. L. Groom, to No. 1 Flying Training Sch., Netheravon, 6.3.30. P. J. Nyhan, to R.A.F. Depot, Uxbridge, 6.2.30; A. H. Barzilai, to Special Duty List, on appointment to a short-service Commn., 17.1.30; J. Murphy, to No. 2 Flying Training Sch., Digby, on appointment to a temp. Commn., 3.2.30.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—Lieut.-Comm. F./O., R.A.F.—I. R. Grant, to *Glorious* (on commg.). Lieuts. F./O., R.A.F.—N. S. Luard, A. M. Pilling, H. Ditton, and R. H. S. Roundell, to *Glorious* (on commg.). J. Wyatt Hale, to *Courageous*, Feb 20.

R.A.F. SPORT R.A.F. Individual Boxing Championships

THE R.A.F. Individual Boxing Championships were concluded at Uxbridge on Friday, March 7. A most enthusiastic crowd witnessed the bouts, which were of a high standard. There was a large amount of really good boxing, but there was also much wild fighting which showed more "go" than science. The material was obviously good, and had great possibilities, but in many cases it appeared to lack training, that is, both physical and boxing training. As a general rule, the contestants seemed to forget that their opponents had a body and they studiously set out to batter each other's heads, while another point which struck one was that in many cases there was a very regrettable waste of energy both in body work and attack. A little training would have gone a long way to developing many of the competitors into real hard hitters, and it seemed to be just the knowledge of how to hit that they lacked.

It would be impossible here to give details of all the contests but there are two which deserve special mention. The final of the Officers' Welterweights was an extraordinary fine effort on the part of P./O. Noblston who, although only a lightweight, was fighting in the welterweights and proceeded to knock out P./O. Dewhurst in the first round and in such a clean decisive manner that his opponent was still unable to come up and receive his cup at the close of proceedings.

In the semi-finals of the Airmen's Middleweights, A./C. Clapp opposed A./C. Morris, and the bout brought out the wonderfully sporting spirit which pervades all service boxing, whether in the Navy, Army or Air Force. Clapp sent Morris to the floor twice at the beginning of the second round and then shortly did so again, but this time for a count of about six; the latter was game to the last and though dazed and quite incapable of continuing the fight was smilingly trying to do so when Clapp was declared the winner.

The previous night had been taken up with the semi-finals, with the exception of one final, which was the Officers' Heavyweights. F./O. Beamish, the holder since Flight-Lieut. Chichester has been abroad, lost to P./O. Williams on points. In the second round Williams went down twice and a victory for Beamish seemed certain; Williams, however, fought his way back and the third round was his.

The final results were:—

OFFICERS

FEATHERWEIGHT

P./O. Purcell (Digby) beat P./O. Vandyck (Bircham Newton) on points.

WELTERWEIGHT

P./O. Noblston (Netheravon) beat P./O. Dewhurst (Old Sarum) (holder) in the first round.

MIDDLEWEIGHT

P./O. McKecknie (Calshot) beat F./O. Warner (Upper Heyford) on points.

LIGHT-HEAVYWEIGHT

P./O. Lord M. A. Douglas Hamilton (Upavon) beat F./O. MacLean (Henlow) on points.

HEAVYWEIGHT

P./O. Williams (Digby) beat F./O. Beamish (Henlow) on points.

AIRMEN

FLYWEIGHT

A./A. Hobbs (Halton) beat A./C. Hunter (Calshot) on points.

BANTAMWEIGHT

L./A.C. Williamson (Henlow) (holder) beat A./C. Johnson (Manston) on points.

FEATHERWEIGHT

Sgt. Davison (Manston) walked over; Cpl. Blaze (Halton) (holder) and Cpl. Leebrook (Uxbridge) both disqualified in semi-final for continuous holding.

LIGHTWEIGHT

A./C. Herlihy (Gosport) beat A./C. Morris (Salisbury) on points.

WELTERWEIGHT

Sgt. Harper (Henlow) beat A.C. Nee (Bircham Newton) on points.

MIDDLEWEIGHT

A./C. Clapp (Old Sarum) beat Cpl. Woods (Henlow) on points.

LIGHT-HEAVYWEIGHT

A./C. Watts (Henlow) beat Cpl. Daley (Felixstowe) in the first round.

HEAVYWEIGHT

L.A.C. Jones (Aldegrave) beat A./C. Forrester (Cranwell) in the third round.

Boxing

SANDHURST V. CRANWELL.

The Royal Military College beat the Royal Air Force College at Sandhurst, on March 7, in a boxing contest by 5 to 4.

The results were:—

BANTAMWEIGHT

G./C. N. F. B. Shaw (Bedford and R.M.C.) beat F./C. E. Nydis (Cambridge University and Cranwell) on points.

FEATHERWEIGHT

F./C. P. Q. Horner (Duncannon and Cranwell) beat S/C. R. C. H. Bellers (Bedford and R.M.C.) on points.

LIGHTWEIGHT

G./C. W. P. B. Arkwright (Eton and R.M.C.) beat F./C. C. D. Stephenson (Shrewsbury and Cranwell) on points.

WELTERWEIGHT

FIRST STRING.—G./C. P. A. Monro (Beaumont and R.M.C.) beat F./C. J. R. MacDonald (Ampleforth and Cranwell) on points.

SECOND STRING.—G./C. R. F. L. Chance (Eton and R.M.C.) beat F./C. R. Monks (Electrical and Wireless School and Cranwell) on points.

MIDDLEWEIGHT

FIRST STRING.—F./C. T. N. Coslett (Barry and Cranwell) beat G./C. R. A. P. Macpherson (Epsom and R.M.C.) in the second round.

SECOND STRING.—F./C. T. S. R. Bader (St. Edmund's, Oxford, and Cranwell) k.o. G./C. J. A. R. Robertson (Epsom and R.M.C.) in the first round.

LIGHT-HEAVYWEIGHT

G./C. J. A. H. Powell (Eton and R.M.C.) beat F./C. M. W. L'I La V. Baker (Kelly College and Cranwell) on points.

HEAVYWEIGHT

F./C. T. B. Coote (Woking and Cranwell) beat G./C. T. R. S. Drought (Charterhouse and R. M. C.) in the second round.

Rugby Football

R.A.F. V. COVENTRY

The R.A.F. XV. went down to Coventry, on Saturday, March 8, by no less than 4 goals and 5 tries (35 points) to 1 goal (5 points). The less said about such a debacle the better, but Lawson must be congratulated on scoring a try for the Air Force, and Llewellyn on kicking the goal. Why a team so obviously superior as Coventry were, did not succeed in keeping their line inviolate is something of a mystery.

AIR POST STAMPS

By DOUGLAS ARMSTRONG

(Editor of "The Stamp Collector")

FROM South and Central America new issues of air post stamps continue to arrive in rapid succession. Scarcely a week passes without some additions to the air post collection from this part of the world.

Latest "Correo Aereos"

As the result of a reduction in the air mail fee between the Canal Zone and the U.S.A. on January 1, two new provisional air stamps were taken into use consisting of a 10 cents value surcharged upon the ordinary 50 cents postage stamp and one of 20 cents denomination extemporised out of the 2 cents carmine. The overprint is in two lines, reading "AIR MAIL" at the top and the value at the foot of the stamp.

The independent republic of Panama has followed suite with a set of three stamps of distinctive design inscribed "Correo Aereo" and depicting an aeroplane flying over a map of the Isthmus. The effect is reminiscent of the earlier postage stamps of the old state of Panama, but the values are expressed in terms of Centesimos de Balboa. Engraved and recess printed by the American Bank Note Company of New York, they comprise 15 c. de b. green, 20 c. de b. carmine and 25 c. de b. blue.

In Nicaragua there appeared on December 15 last another striking set of three air post stamps emanating from the same atelier and showing in enlarged format two aeroplanes in flight over the crater of Mount Momotombo, their denominations and colours being:—25 centavos bronze-green, 50 c. sepia and 1 Cordoba scarlet. These permanently supersede the provisional surcharges hitherto in use for the air mail service.

Salvador has also a permanent air stamp series on order from the U.S.A., but meanwhile has adapted various current and obsolete postage stamps by overprinting them with the inscription "Correo Aereo" and surcharging with new values equivalent to prevailing air mail rates, as follows:—15 c. on 10 centavos orange, 20 centavos green, 25 on 35 c. rose and olive-green, 40 c. on 50 c. red-brown, 50 c. on 1 Colon green and ultramarine. They were first issued to the public on January 1, 1930.

For the opening of a regular air mail service between Tegucigalpa and New York, Honduras recently produced two further air post provisionals surcharged vertically in gold currency upon stamps of the regular postage series of 1923 pending the arrival of a permanent air mail series now in course of preparation. The surcharges are 5 cts. on 10 c. blue (in red) and 20 cts. on 50 c. vermilion (in black) and the inscription reads "Servicio Aereo Internacional-Vale- cts. oro, 1929." The definitive air post stamps, when they appear, will comprise denominations 5 and 20 centavos, 1 and 5 pesos.

Mexican Aviation Week

By way of publicity for an Aviation Week held in Mexico from December 10 to 16, 1929, two special stamps were issued, supplementary to the regular air post series in a design showing an aeroplane over the Cathedral of Mexico City, of which the 20 centavos is printed in dark green and the 40 c. in violet. Although 100,000 stamps were provided in the former denomination, the edition of the 40 centavos was restricted to 3,000 copies, all of which were quickly "sold out."

Permanent Paraguayans

The initial values of the permanent air stamp series for this country foreshadowed some months ago made their appearance at the New Year in the shape of a 95 centavos denomination bearing a reproduction of the national arms surmounted by an aeroplane and 1 peso 90 c. representing an aeroplane flying over the cathedral at Asuncion. Both stamps exist in two varieties of colour, the 95 c. in deep blue on azure and carmine on rose and the 1 p. 90 c. in violet on azure and red on pink. There remain to be issued in this series air post stamps of \$2.85, \$3.40, \$4.75, \$5.65, \$6.80 (in two colours), \$9.45, \$11.30, \$14.10, \$17, \$33.75 and \$102. Pending the appearance of the remaining values in the definitive types a further crop of provisional surcharges may be expected.

Brazilian Portrait Stamps

Portraits of the pioneer aviators Augusto Severo and Alberto Santos Dumont adorned the two highest values of the latest Brazilian air stamps, recently issued, viz., 5,000 reis carmine and 10,000 r. olive-green. Both stamps are recess printed by the Rio de Janeiro Mint in large upright rectangular format and make a fitting conclusion to this historically interesting set.

PUBLICATIONS RECEIVED

U.S. National Advisory Committee for Aeronautics, Reports: No. 317.—Wind Tunnel Tests on a Series of Wing Models Through a Large Angle of Attack Range—Part I. Force Tests. By M. Knight and C. J. Wenzinger. Price 25 cents. *No. 319.*—Aerodynamic Characteristics of Twenty-Four Airfoils at High Speeds. By L. J. Briggs and H. L. Dryden. *No. 320.*—The Measurement of Fluctuations of Air Speed by the Hot-Wire Anemometer. By H. L. Dryden and A. M. Kuethe. *No. 324.*—Flight Tests on U.S.S. "Los Angeles" Part I. Full Scale Pressure Distribution Investigation. By S. J. de France. Price 15 cents. Part II. Stress and Strength Determination. By C. P. Burgess. Price 15 cents. *No. 326.*—Tests of Five Metal Model Propellers with Various Pitch Distributions in a Free Wind Stream and in Combination with a Model VE-7 Fuselage. By E. P. Lesley and E. G. Reid. Price 15 cents. U.S. Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

Empire Forestry Journal. Vol. 8. No. 2. 1929.—The Empire Forestry Association, 22, Grosvenor Gardens, S.W.1. Price 7s. 6d. net.

Aeronautical Research Committee Reports and Memoranda: No. 1251.—Some Early Model Experiments on Devices for Improving Lateral Control near the Stall. By H. B. Irving and A. S. Batson. July, 1929. Price 1s. net.

Journal of "The Royal Aeronautical Society," with which is incorporated "The Institution of Aeronautical Engineers." No. 230. Vol. XXXIV. February, 1930. The Royal Aeronautical Society, 7, Albemarle Street, London, W.1. Price 3s. 6d.

Notiziario Tecnico di Aeronautica, Ministero dell' Aeronautica. Vol. VI. No. 1. Provveditorato Generale dello Stato Libreria Rome. Price L.10.

The Journal of the Royal Air Force College, Cranwell. Vol. X. No. 1. Spring, 1930.—The R.A.F. Cadet College Journal, R.A.F. Cadets' Mess, Cranwell, Lincs.

The Gauge. Vol. 8. No. 6. February, 1930. J. J. Habershon and Sons, Ltd., Holmes Mills, Rotherham.



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Published March 13, 1930

5,510. H. and M. FARMAN. Driving and clutching devices for rotary air compressors of aviation engines. (308,301)
9,867. H. JUNKERS. Manufacture of metal doors. (316,286.)
24,904. A. E. L. CHORLTON, R. A. DE H. HAIG and H. J. STEIGER. Cantilever spars for aircraft. (325,465.)

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